Technical Documentation

Hand-held Analyzer 2250 Light

With Sound Level Meter Software BZ-7130
1/1-oct. Frequency Analysis Software BZ-7131
1/3-oct. Frequency Analysis Software BZ-7132
Logging Software BZ-7133
Signal Recording Option BZ-7226 and
Tone Assessment Option BZ-7231

User Manual

Brüel & Kjær

English BE 1766 –23

Hand-held Analyzer
2250 Light

with the following 2250 Light Software:

Sound Level Meter Software BZ-7130
1/1-oct. Frequency Analysis Software BZ-7131
1/3-oct. Frequency Analysis Software BZ-7132
Logging Software BZ-7133
Signal Recording Option BZ-7226
Tone Assessment Option BZ-7231

User Manual

Valid for all hardware versions and from software versions 4.4

BE 1766 – 23

February 2015

Safety Considerations

This apparatus has been designed and tested in accordance with IEC 61010 – 1 and EN 61010 – 1 *Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use*. This manual contains information and warnings which must be followed to ensure safe operation and to retain the apparatus in safe condition. Special note should be made of the following:

Safety Symbols

The apparatus will be marked with this symbol when it is important that you refer to the associated warning statements given in the manual.

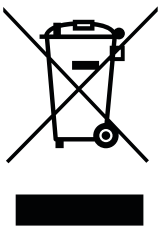
Protective Earth Terminal Hazardous Voltage

Explosion Hazard

The equipment is not designed to be used in potentially explosive environments. It should not be operated in the presence of flammable liquids or gases.

Warnings

- Switch off all power to equipment before connecting or disconnecting their digital interface. Failure to do so could damage the equipment.
- Whenever it is likely that the correct function or operating safety of the apparatus has been impaired, it must be made inoperative and be secured against unintended operation.
- Any adjustment, maintenance and repair of the open apparatus under voltage must be avoided as far as possible and, if unavoidable, must be carried out only by trained service personnel.



- Do not dispose of electronic equipment or batteries as unsorted municipal waste
- It is your responsibility to contribute to a clean and healthy environment by using the appropriate local return and collection systems
- Hazardous substances in electronic equipment or batteries may have detrimental effects on the environment and human health
- The symbol shown to the left indicates that separate collection systems must be used for any discarded equipment or batteries marked with that symbol
- Waste electrical and electronic equipment or batteries may be returned to your local Brüel & Kjær representative or to Brüel & Kjær Headquarters for disposal

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Chapter 1

Introduction

1.1 Welcome

This user manual describes the 2250 Light (Type 2250-L), including:

- Sound Level Meter Software for 2250 Light, BZ-7130
- 1/1-octave Frequency Analysis Software for 2250 Light, BZ-7131
- 1/3-octave Frequency Analysis Software for 2250 Light, BZ-7132
- Logging Software for 2250 Light, BZ-7133
- Signal Recording Option BZ-7226
- Tone Assessment Option BZ-7231

The manual explains how to perform a basic sound measurement, which parameters you can measure and how the hand-held analyzer should be operated. In addition, some practical hints and guidelines are provided, including all relevant technical specifications. Finally, a glossary is added to help with specific terminology found in this manual.

This manual is intended for all hardware versions (from 1 to 4). All hardware versions support the latest application software covered in this manual.

1.2 How to Use this Manual

1.2.1 Conventions Used in this Manual

"Analyzer" refers to 2250 Light (Type 2250-L) unless otherwise specified.

Instructions and descriptions that refer to the analyzer pushbuttons are shown with the pushbutton icons as seen on the analyzer. See Chapter 2 for a list of pushbutton icons and their functions.

Icons, Buttons and Tabs Used on the Screen

Indicated by bold type face (for example, tap the **Main Menu** icon).

Parameter Text Appearing on the Screen

Parameters, instructions and descriptions appearing on the screen are indicated by italics (for example, *Measurement Mode*).

Path Denotations

Indicated by capitals (for example, SETUP\BZ7222\).

Menu/Screen Navigation

Indicated by italics (for example, *Setup* > *Frequency Settings* > *BB Peak*).

1.2.2 Beginners

Before you read the rest of this manual, read Brüel & Kjær's primer on Measuring Sound. This will give you a basic idea of acoustic measurements. It can be found on the www.bksv.com website, by typing 'Primer' in the search window. The website also contains lots of other information you might find useful.

Further information is available in the on-line help installed on the analyzer.

1.2.3 Experienced Users of Acoustic Measurement Equipment

The manual is designed so that you do not have to read all of it to be able to use the instrument. It is built around the most frequently used operations, these are as follows:

- Assembling Your Analyzer (see Chapter 2)
- Making Your First Measurement (see Chapter 3)
- Getting to Know Your Analyzer (see Chapter 4)
- Calibration (see Chapter 5)
- Data Management (see Chapter 6)
- Connection to PC or Smart Phone (see Chapter 7)
- Advanced Use of Your Analyzer – Tips and Tricks (see Chapter 8)
- Updating, Maintenance and Troubleshooting (see Chapter 9)

However, it is recommended that you read the entire manual for appropriate procedures on how to use the analyzer to obtain accurate sound level measurement results.

Chapter 2

Assembling Your Analyzer

This chapter describes how to assemble and set up your analyzer. It provides a brief description and an associated diagram showing the instrument's components and the various input and output connections. This enables you to start getting familiar with the instrument, while assembling a system.

This is followed by an overview of the hardware components, showing all the main configurations of the instrument and its accessories.

Finally, instructions are provided that explain how to assemble standard and optional hardware components used in your system. Once you have followed the assembly instructions, your hand-held analyzer will be ready to make measurements.

2.1 Determining Your Hardware Version

Over the years, the analyzer hardware has had a few updates. The most significant update happened in 2012 with the introduction of hardware version 4 (also known as G4). To check if your analyzer uses G4 hardware, click ? in the Shortcut Bar at the bottom of the display screen, and select **About**. The **About** menu will list the hardware and software versions currently installed.

2.1.1 What is Different with G4 Hardware?

The differences in the G4 hardware compared to previous versions include:

- A brighter screen which is easier to view in direct sunlight
- The CF card slot is removed and replaced by a second SD card slot to take advantage of the SD format's dominance in the storage and Wi-Fi markets
- The USB connector changed from USB 1.1 Mini B to USB 2.0 Micro AB. Besides the faster connection speeds of USB 2.0, the Micro USB connector is more common
- A second standard USB Type A socket was added for easier connection to USB peripherals like modems, printers, GPS receivers, and USB to RS–232 adaptors

- A 100 Mbps LAN connector is available
- A Trigger Input socket for external trigger of signal recordings
- An Input socket and an Output socket (both currently not in use)

2.2 Instrument Components

An overview of the main instrument components is provided in Fig.2.1. The descriptions that follow refer to those components.

Fig. 2.1 *Instrument components*

1) **Measurement Microphone:** A Brüel & Kjær Prepolarized Free-field ½″ Microphone is used. A robust and reliable microphone with a wide frequency range

2) **Preamplifier:** Used to convert the high-impedance output of the microphone to low impedance, suitable for driving long extension cables

3) **(Manual Event 1 Pushbutton):** This allows you to manually indicate events during a measurement. Using 2250 Light software BZ-7130, BZ-7131 and BZ-7132, you can control signal recording, while with BZ-7133 you can insert an event marker and control recordings

   Note: Signal recording requires a Signal Recording Option BZ-7226 license as well.

4) **(Manual Event 2 Pushbutton):** A second pushbutton is provided to allow you to mark a second type of event during a measurement

5) ▲, ▼, ◄, ► **(Navigation Pushbuttons):** These move the active screen component (Field Selector) and navigate the user interface

6) **(Back-erase Pushbutton):** This allows you to erase the last 5 seconds of measurement data or to insert an Exclude Marker (BZ-7133 Logging Software for 2250 Light only)

7) **(Accept Pushbutton):** This allows you to accept any changes you make to the instrument's setup

8) **(Reset Measurement Pushbutton):** This allows you clear the current measurement from the screen

9) **(Start/Pause Pushbutton):** Press this to start, pause or continue with a measurement

10) **(Status Indicator):** The red, yellow or green lights, (or LEDs), referred to as the 'Traffic Light' either side of the **Start/Pause** pushbutton, indicate important states of the instrument during operation, that is, measurement stopped, paused or running. See Chapter 4 for further details

11) **(Save Pushbutton):** This allows you to save measurement results

12) **Display Screen:** A high-contrast, black and white, touch-sensitive screen

13) **(Main Menu Icon):** This calls up the Main Menu, which allows you to navigate immediately to all the main functions of the instrument, such as **Setup**, **Explorer** (or Data-browser), **Preferences**, and the **Calibration** procedure

14) **(Power-on Pushbutton):** Turns the instrument on and off. If held in for 1 second, the instrument goes into standby mode; if held in for more than 4 seconds, it turns the instrument off

15) **Stylus:** Stored in a holder on the side of the instrument, for use on the touch-sensitive screen. You can choose to use the stylus or the pushbuttons, depending on your preference and the measurement situation. (Also see section 4.4.5.)

16) **Top Socket:** This is the microphone input socket for 2250 Light. The Measurement Microphone and Preamplifier (items 1 and 2 respectively) are connected directly to this socket. For more details see section 2.3 that follows

17) **Tripod Mounting Thread:** Use this to mount 2250 Light onto the tripod and/or tripod extension

18) **Wrist Strap/Tripod Mounting Thread:** Use this to attach the wrist strap to 2250 Light for added security, or use it to mount 2250 Light onto the tripod and/or tripod extension using the tripod adaptor UA-1673

19) **Internal Battery Pack:** Rechargeable, high-capacity Li-Ion battery pack to power 2250 Light

20) **Hinged Cover:** A removable plastic cover is provided, which is hinged at the top to provide protection for the connector panel underneath. To remove, open the cover and pull the hinge out of the slot at the top of the connector panel. The cover includes a rubber insert printed with an overview of the main connectors and reset button for easy recognition. Indents are provided on the inside of the cover (behind the insert) that allow you to drill holes in the plastic cover, giving access to the main connectors underneath, so you can fit the cover while power or other cables are connected.

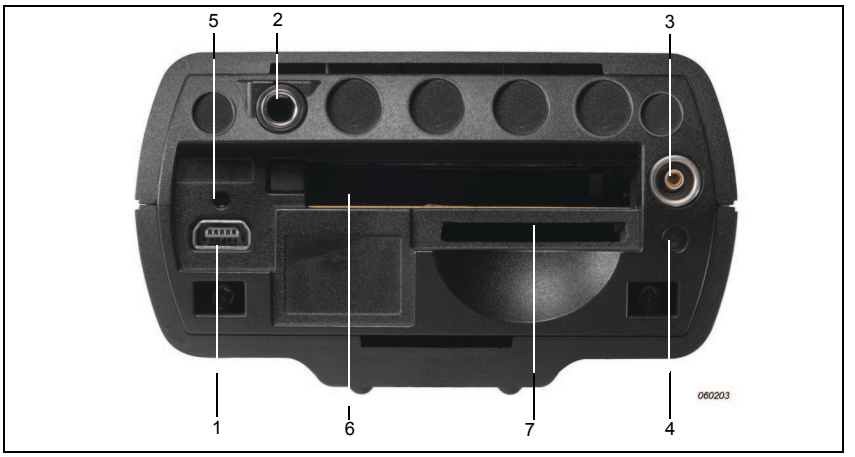
21) **High Speed USB and LAN Interfaces (hardware version 4 only):** This is used to provide fast and seamless transfer of data and recordings back to the office. Both high-speed interfaces, USB or LAN, can be used when the analyzer is located in close proximity to the PC. However, if the analyzer is remote from the host PC, the LAN interface has the further advantage of data download from anywhere within the same LAN network. Both interfaces are not just used for data download, but also for remote monitoring and remote control.

22) **G4 Mark:** Indicates that the hardware is version 4. Without this mark, your hardware is an earlier version

2.3 Analyzer Inputs/Outputs

2.3.1 Hardware Versions 1 – 3:

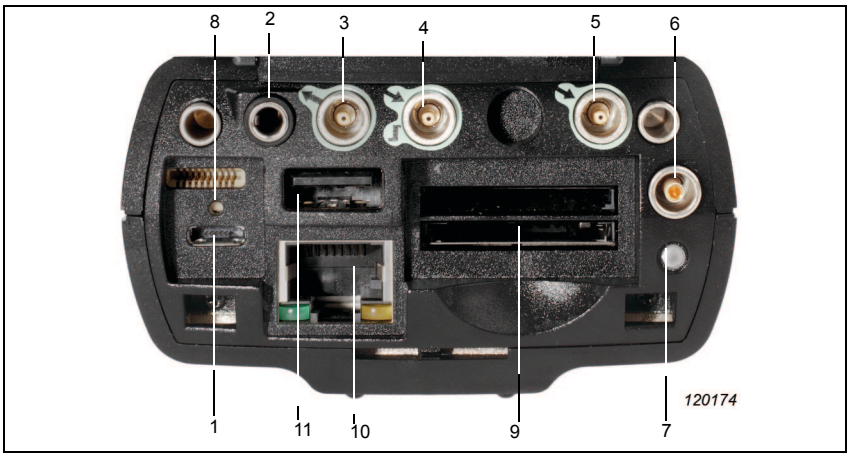
Fig. 2.2 *Connector panel of 2250 Light for hardware versions 1 – 3*



1) **USB Interface Socket:** Use the supplied Mini USB Cable AO-1476 to connect
2) **Earphone Socket:** Use the optional Earphones HT-0015 to connect
3) **External Power Socket:** Use Mains Power Supply ZG-0426 to connect and charge batteries
4) **Battery Charge Indicator:** An LED that indicates when the battery pack is being charged from external power. See section 2.3.1 for more information on the LED color codes
5) **Reset Button:** Press to reset the analyzer if you have problems
6) **Compact Flash Card Slot:** Insert a CF memory card to save data or connect a modem (either a compact flash modem or using an CF to Serial converter)
7) **Secure Digital Card Slot:** Insert a SD or SDHC memory card to save data

2.3.2 Hardware Version 4:

Fig. 2.3 *Connector panel of 2250 Light for hardware version 4*



1) **Micro USB Interface Socket:** Use the supplied Micro USB Cable AO-1494 to connect
2) **Earphone Socket:** Use the optional Earphones HT-0015 to connect
3) **Output Socket:** Not used
4) **Trigger Input Socket:** Use this triaxial LEMO connector to control signal recording – see section 2.3.1 for more information
5) **Input Socket:** Not used
6) **External Power Socket:** Use Mains Power Supply ZG-0426 to connect and charge batteries
7) **Battery Charge Indicator:** An LED that indicates when the battery pack is being charged from external power. See section 2.3.1 for more information on the LED color codes
8) **Reset Button:** Press to reset the analyzer if you have problems

9) **Secure Digital Card Slots:** Insert a SD or SDHC memory card to save data

10) **LAN Socket:** Connect a LAN cable to synchronise measurement and setup data with a host PC over a Local Area Network

11) **USB A Socket:** Connect to printers or other external USB devices

2.3.3 Description of Inputs and Outputs

Top Socket

See item 16 in Fig. 2.1.

This 10-pin LEMO connector is the microphone input for the analyzer. Microphone Type 4950 (including Preamplifier ZC-0032) is normally connected directly to this connector. If required, however, one of two microphone extension cables (AO-0697-D-030, 3 m, or AO-0697-D-100, 10 m), can be fitted between the input stage and the main microphone input socket, to extend the distance to the desired length.

USB Interface

See item 1 in Fig. 2.2 and items 1 and 11 in Fig. 2.3.

The USB Interface provides high-speed direct communication via your PC's USB port to synchronize measurement and setup data.

– Hardware versions 1 – 3: Use the supplied Mini USB Cable AO-1476
– Hardware version 4 (G4): Use the supplied Micro USB Cable AO-1494

Connect to a Printer or External Device via USB

For hardware versions 1 – 3, use the supplied Adaptor AO-0657 to connect to a printer that supports PCL® language via the USB socket.

For hardware version 4 (G4), use the standard USB Type A socket (item 11 in Fig. 2.3) on the analyzer to connect to printers or other external USB devices.

Earphone Socket

See item 2 in Fig. 2.2 and Fig. 2.3.

The 3.5 mm minijack earphone socket enables the instrument to be connected to a set of headphones/earphones, for reviewing recorded comments or for monitoring the measured sound. Use the optional Earphones HT-0015.

External Power

See item 3 in Fig.2.2 and Fig.2.3.

2250 Light is powered by an internal rechargeable battery pack. An indication of available charge is shown by the battery icon at the bottom of the screen. If the charge remaining is low or empty, the batteries can be recharged by connecting Mains Power Supply ZG-0426 or ZG-0429 to the 'Ext. Power' socket. When the power supply lead is connected, the icon will be displayed in place of the battery icon.

⚠ **CAUTION:**

- Use specified battery charger only
- Charging below 0°C (32°F) is not recommended. If you charge the battery pack below 0°C, the lifetime of the batteries will be reduced
- Do not charge battery pack at temperatures above 60°C
- Do not disassemble or expose battery pack to fire or water

Battery Charge Indicator

See item 4 in Fig.2.2 and Fig.2.3.

A battery charge light, (LED), indicates when the battery pack is being charged from external power.

- With hardware versions 1 – 3: The LED is a steady green light when external power is applied (and the battery is charging), and a flashing green light when charging has finished
- With hardware version 4 (G4): The LED is red when external power is applied (and the battery is charging); green when the battery is completely charged; and blue to indicate that the unit is in stand-by and battery powered

Reset Button

See item 5 in Fig.2.2 and Fig.2.3.

Located above the USB connector, it is used to reset 2250 Light if you have problems with the instrument and cannot get it to operate. To reset, press the button with the point of the stylus. See Chapter 9 for troubleshooting.

Slot for Compact Flash (CF) Cards

With hardware versions 1 – 3 only (see item 6 in Fig.2.2).

This slot accepts CF sized-cards and can be used for memory, or for example, a modem.

Slot for Secure Digital (SD) Cards

See item 7 in Fig.2.2 and item 6 Fig.2.3.

This slot accepts SD and Secure Digital High Capacity (SDHC) memory cards and is typically used to save measurement data. Capacities up to 32 gigabytes are acceptable.

Note: Hardware versions 1 – 3 have only one SD card slot. Hardware version 4 has two slots.

Input and Output Sockets

See items 7 and 9 in Fig. 2.3.

These sockets are currently not available for use.

Trigger Input Socket

See item 8 in Fig. 2.3.

This triaxial LEMO connector is used for the external trigger of signal recordings. If you want to start and stop the recording using an external device, connect it to this input. See details in Appendix A.

Note: Signal recording requires a license for the BZ-7226 option.

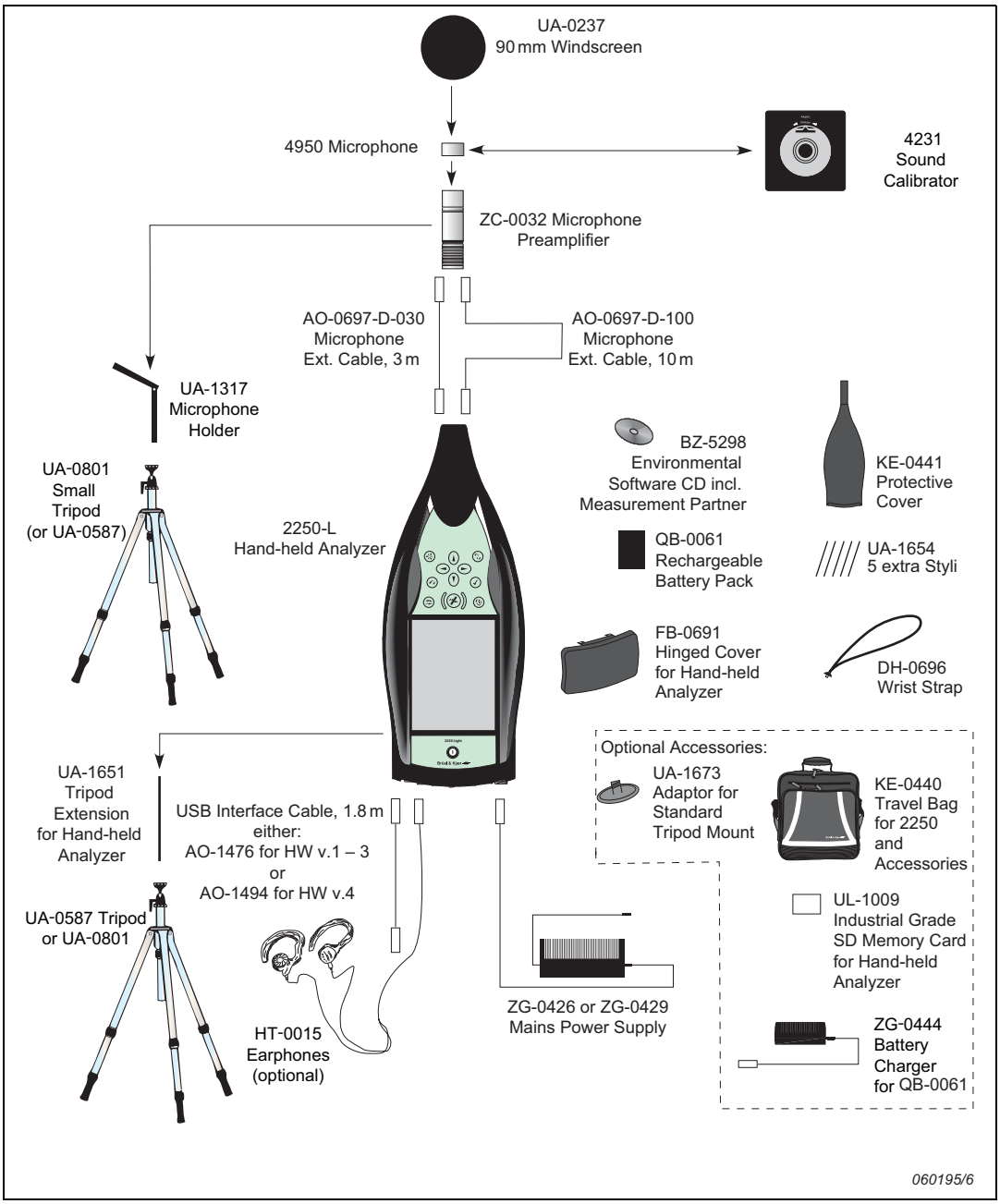
LAN Socket

With hardware version 4 only – see item 11 in Fig. 2.3.

The LAN Socket provides high-speed direct communication with a Local Area Network. It is used to synchronise measurement and setup data with a host PC. The yellow LED on the right is on when there is a link. The green LED on the left blinks when there is activity on the LAN connection.

2.4 Hardware Setup

Fig. 2.4 *2250 Light – hardware overview*



2.5 Assembling 2250 Light

2.5.1 Charging the Battery for the First Time

Battery Pack QB-0061 comes charged to approximately half capacity on initial delivery. Before using your 2250 Light for the first time, it is recommended that you fully charge the battery pack, by connecting Mains Power Supply ZG-0426 (or ZG-0429) to the external power socket. It should take approximately 8 – 10 hours.

The battery charge light shows a steady green light when external power is applied (and the battery is charging), and a flashing green light when charging has finished. You can leave 2250 Light with external power on, even when the battery is fully charged. Also see section 9.3.3.

2.5.2 Making Good Measurements

The fact that you are using your 2250 Light, which fully complies with the IEC 61672–1 standard, ensures you always make good measurements. 2250 Light should be set up using the following recommended assembly instructions. This is to minimise the influence of acoustical reflections during measurements. All the components described below are shown in Fig. 2.1 and Fig. 2.4.

Another set of instructions is provided in section 2.5.3, for situations where you need to position the microphone at a distance from 2250 Light, while still complying with the standard.

Placing the Measurement Microphone

The measurement microphone must be placed away from shielding, reflecting, or absorbing objects. In a diffuse sound field, absorbing objects will reduce the measured sound levels. In a free sound field, reflecting objects can change the measured sound levels. Typically, the sound level 0.5 m from a plane reflecting wall is 3 dB higher than if there was no wall.

The operator of the system may be personally shielding, absorbing, and reflecting, and can be an additional noise source. Measure downwind in dry conditions with a windspeed less than 5 m/s.

The optimum position for the microphone is best found by trying different positions and observing the resulting sound levels.

Mounting the Measurement Microphone

Before mounting the measurement microphone, note the following precautions:

- When screwing on the microphone, **do it gently** to avoid damaging threads
- Keep dust and foreign matter off the microphone diaphragm. **Do not touch** the diaphragm with anything – it is very delicate

Note: Once the measurement microphone and preamplifier have been assembled and connected to your 2250 Light, they should normally be left connected to the instrument.

To Connect:

1) Gently screw Microphone Type 4950 onto Preamplifier ZC-0032 (see items 1 and 2 in Fig. 2.1).

2) Insert the male plug of the preamplifier into the top socket of the Hand-held Analyzer (see item 17 in Fig. 2.1) and push gently until it snaps into position.

To Disconnect:

1) To remove the preamplifier and microphone, grip the locking collar firmly and slide back, to remove the preamplifier and microphone combination from 2250 Light.

Mounting the Windscreen

For short outdoor noise measurements (or indoor measurements exposed to air movement), mount Windscreen UA-0237 onto the microphone and preamplifier combination.

Mounting 2250 Light onto the Tripod Extension Stem and Tripod

Mount 2250 Light onto the Tripod Extension Stem UA-1651 and Small Tripod UA-0801, as follows:

1) Screw Tripod Extension Stem UA-1651 onto the threaded stud of the ball-joint on Small Tripod UA-0801. Secure the ball-joint in a roughly vertical position (that is, in-line with the tripod) until ready to follow the instructions in step 4).

2) Screw the Extension Stem UA-1651 into the 2250 Light, using the threaded socket situated on the underside of 2250 Light, at the back, (see item 18 in Fig. 2.1).

3) Set Small Tripod UA-0801 (including 2250 Light) in the required position, and adjust it to the required height. Ensure that one of the three legs is pointing in roughly the same direction as your 2250 Light needs to point. (We will refer to this leg as the front leg.)

4) Position the extension stem at an angle of 45° to the horizontal and vertically in-line with the front leg of the tripod – this is to ensure the whole setup is stable.

Note: The procedure is the same if Tripod UA-0587 is used instead of Small Tripod UA-0801.

Once you have carried out these instructions, you are ready to start measuring, see Chapter 3.

2.5.3 Alternative Measurement Method (Extended Microphone)

The measurement microphone can be placed a distance from 2250 Light by connecting an extension cable and fitting the microphone to a microphone holder. 2250 Light should be set up using the following assembly instructions. This is to ensure that the accessories have limited acoustical influence on the instrument during measurement. All the components described below are shown in Fig. 2.1 and Fig. 2.4.

Connecting a Microphone Extension Cable

There are two optionally available extension cables which are recommended for use with 2250 Light. These are:

- AO-0697-D-030: 3 m long
- AO-0697-D-100: 10 m long

Note: Connecting a recommended microphone extension cable has no appreciable effect on the Hand-held Analyzer's measurement and has no effect on the instrument's calibration. However, although it is not essential to re-calibrate, it is good measurement practice to calibrate the whole measurement chain (including microphone extension cable) before starting a measurement.

Decide which cable you require and assemble as follows:

1) Gently screw Microphone Type 4950 onto Preamplifier ZC-0032 (see items 1 and 2 in Fig. 2.1).
2) Insert the preamplifier into the female plug of the extension cable and push gently until it snaps into position.
3) Insert the male plug of the extension cable into the top socket of the Hand-held Analyzer (see item 17 in Fig. 2.1) and push gently until it snaps into position.

Mounting the Measurement Microphone on the Microphone Holder and Tripod

Mount the microphone and preamplifier combination onto Microphone Holder UA-1317 and Small Tripod UA-0801, as follows:

1) Set Small Tripod UA-0801 in the required position, and adjust to the required height.
2) Screw Microphone Holder UA-1317 onto the threaded stud on the tripod ball-joint, and position the holder as required.
3) Push the microphone and preamplifier combination carefully into the microphone holder, so that it grips onto the body of the microphone and preamplifier. Ensure that the microphone lead sits properly in the plastic guide.

Once you have carried out these instructions, you are ready to start measuring, see Chapter 3.

2.5.4 Measuring for Convenience

Measurements that need to be done at short notice, with no particular accuracy can be carried out by simply holding the instrument or using any combination of hardware components and accessories shown in Fig. 2.4.

Chapter 3

Making Your First Measurement

3.1 Introduction

This chapter describes how to make a basic measurement and how to save and document the results. It assumes you have just received your analyzer and are turning it on for the first time.

Note: A stylus is stored in a holder on the side of the instrument, see item 15 in Fig. 2.1. This can be used on the touch-sensitive screen to select icons and functions during the procedures that follow. Alternatively, you can use the various pushbuttons, see items 3 to 11 in Fig. 2.1.

The following procedures assume that the measurement microphone and preamplifier have been mounted as described in Chapter 2 and the analyzer has a fully charged battery, see section 2.5.1.

3.2 Point and Shoot

Using the following basic procedure you will be able to start using your hand-held analyzer immediately to make measurements and start the familiarisation process:

1) Switch on by pressing ⏻ and make sure the **Sound Level Meter** project template is selected (see section 3.3.3 for instructions).

2) Check that the data path at the top of the screen displays the correct job/project, (that is, where you want to save the new data). See section 6.1.1.

3) Set *Measurement Mode* to *Manual* and change any setup parameters by tapping the **Main Menu** icon ☰ and selecting **Setup** from the drop-down that appears.

4) Press the **Start/Pause** pushbutton, then monitor the status indicator (traffic light).

5) Use the **Start/Pause**, **Continue**, **Back-erase** and **Reset** pushbuttons to control the measurement.

6) When measurement has finished, press the **Save** pushbutton to save your data.

7) To view and organise your data, tap the **Main Menu** icon and select *Explorer*.

Note: You are not required to set any measurement ranges, the analyzer has a dynamic range of more than 120 dB, from 140 dB down to the noise floor of the microphone, (if the microphone has nominal sensitivity).

3.2.1 Congratulations!

You should now be familiar with the basic principles of the analyzer. If you need more help, the following section goes into the measurement process in more detail. If not, please refer to Chapter 4.

3.3 Making a Measurement

3.3.1 What is a Project Template?

A project template contains all the common display settings and measurement setups required to perform a noise measurement. The template does not contain any measurement data – these data are saved as individual projects, stored in job folders, see section 6.1.1. The project templates covered by this manual, are:

- Sound Level Meter Project Template (included in BZ-7130 software)
- 1/1-octave Frequency Analysis Project Template (included in BZ-7131 software)
- 1/3-octave Frequency Analysis Project Template (included in BZ-7132 software)
- Logging Project Template (included in BZ-7133 software)

Note 1: Signal Recording Option BZ-7226 does not contain a specific template – signal recording options are available in all templates.

Note 2: Tone Assessment Option BZ-7231 does not contain a specific template – tone assessment options are available in all templates included with BZ-7132/33.

If you make any changes to the settings in a Project Template, an '∗' will appear next to the template name to indicate that the new settings have not been saved. Select *Save Template* from the **Main Menu** to save the settings in the current template.

3.3.2 Switching On

Switch the analyzer on by pressing ⏻. The start-up time depends on the state the analyzer was in when last switched off and it may take up to 2 minutes from a cold start, or up to 10 seconds if the instrument is already in Standby Mode (that is, from a warm start).

Note: A cold start is a re-boot of the analyzer from ROM. This normally occurs after the analyzer has been turned off for some time, either by the user or following an automatic power-down. A warm start takes the analyzer quickly from Standby mode to fully operational without having to re-boot. (The battery needs to be charged for this to happen, see section 2.5.1.)

3.3.3 Set the Sound Level Meter Project Template

After initialization, the screen shown in Fig. 3.1 appears:

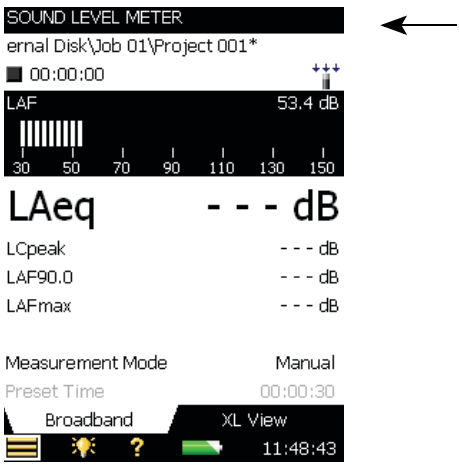
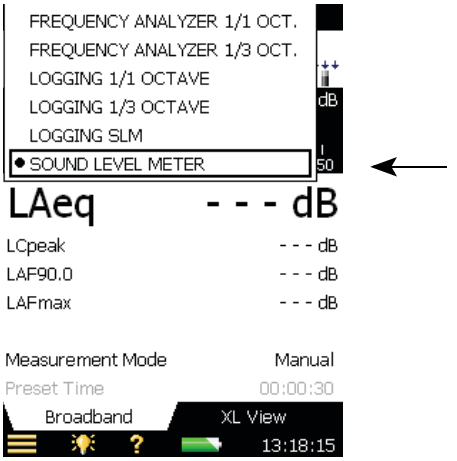


Fig. 3.1
Initial sound level meter screen

1) Check that the **SOUND LEVEL METER** project template is displayed at the top of the screen, see Fig. 3.1. If not, use the stylus to tap on the bar at the top of the screen to reveal a drop-down list and select **SOUND LEVEL METER** from the list (Fig. 3.2).

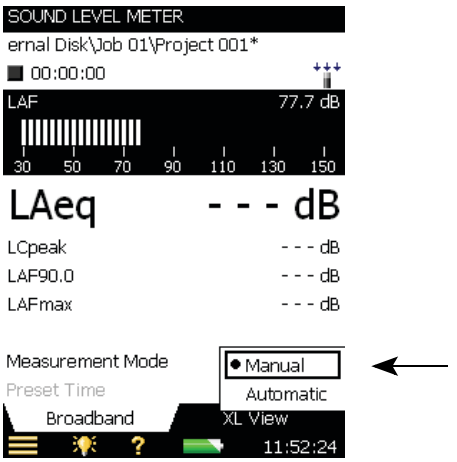
Fig. 3.2
Changing the project template



2) Tap on *Measurement Mode* in the view area and set to *Manual* (Fig. 3.3).

Note: The bar graph showing the sound pressure level L_{AF} is now live. This is because L_{AF} is an instantaneous value, always available for display. Other parameters, such as L_{Aeq} is a measured value that needs to be averaged over a period of time and cannot be displayed before you have started a measurement using the **Start/Pause** pushbutton.

Fig. 3.3
Setting the measurement mode



3) Press the **Start/Pause** pushbutton to start the measurement.

Note: *Start* briefly appears on the screen as feedback when you press the **Start/Pause** pushbutton.

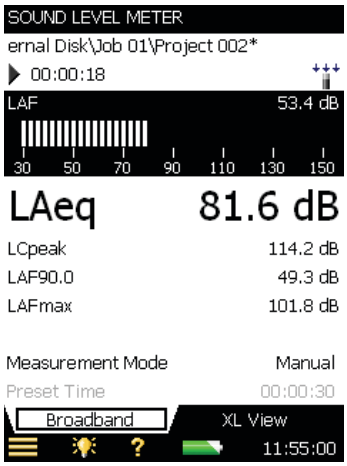
Notice the **Running** icon on the screen and monitor the red, yellow, green status indicators around the **Start/Pause** pushbutton while you are measuring.

The indications should be as follows:

- Yellow status indicator flashing every 5 s before starting the measurement
- Steady green status indicator after pressing the **Start/Pause** pushbutton and during the measurement (if everything is OK)
- Yellow status indicator flashing every 5 s when you have stopped, saved the measurement and are ready to do another measurement
- Yellow status indicator flashing slowly, 0.5 s on, 0.5 s off, if you pause the measurement
- Red status indicator flashing rapidly if you encounter an overload condition during the measurement

4) Use the **Start/Pause**, **Continue**, **Back-erase** and **Reset** pushbuttons to control the measurement. The status field at the top of the screen will give short textual feedback on the pushbutton operation. A visual indication of measurement status is also displayed on the status line, by way of the **Stopped** icon ■, the **Running** icon ▶ and the **Paused** icon ❙❙ (Fig. 3.4).

Fig. 3.4
Measurement feedback in the status field



5) Toggle between different display parameters, as required, by tapping on each parameter field (for example LAF90.0 in Fig. 3.4) with the stylus and selecting other parameters from the drop-down lists that appear.

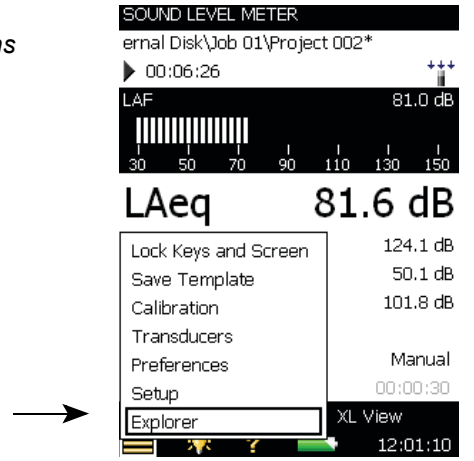
Note: The tabs at the bottom of the screen allow you to choose different ways of displaying the measurement results:

- The **Broadband** view shows an instantaneous L_{AF} readout, with associated bar graph and four measurement parameters, followed by two measurement setup parameters. (The first parameter is displayed in a larger font size for better readability (Fig. 3.4.))
- The **XL View** increases the size of the first parameter readout to a four-digit, full-screen display (including decimal point)

6) Set *Measurement Mode* to *Automatic* and choose a preset time for your measurement. Then repeat steps 3 and 4. The measurement will automatically pause after the preset time. This allows you to either save your measurement or continue measuring, as required.

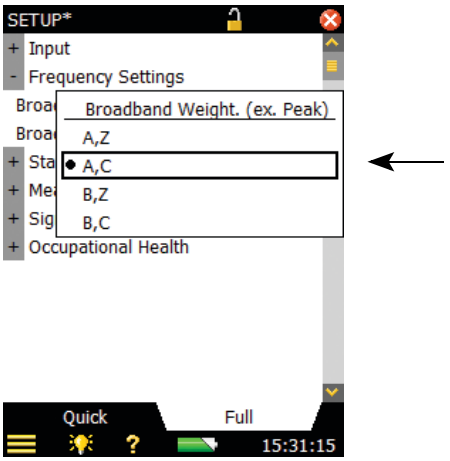
7) Tap the **Main Menu** icon and select *Setup* from the list of options (Fig. 3.5).

Fig. 3.5
Main Menu options



Change the broadband weighting parameters by tapping on the 'plus' icon + next to *Frequency Settings*, then on the weighting parameter field on the right side of the screen. A weighting drop-down menu will appear (Fig. 3.6). Change the parameters as required.

Fig. 3.6
Changing the broadband frequency settings



8) Return to the bar graph screen of the **SOUND LEVEL METER** template, by tapping and you are ready to make a new measurement.

3.4 Save your Measurement

When you have completed your measurement, you need to save it. By default, 2250 Light creates a job folder called *JOB 01*. Job folders represent the upper level of the data (or file) management system, with individual measurements or sets of data, represented by projects appearing under the relevant job. By default 2250 Light also creates a project called *PROJECT 001* under *JOB 01*. (Subsequent measurements will be labelled *PROJECT 002*, *PROJECT 003*, etc., under *JOB 01*. This will happen each time you have saved a measurement.)

Check that the data path at the top of the screen displays *\JOB 01\PROJECT 001** and save your measurement by pressing the **Save** pushbutton. For more details refer to section 6.1.

Note: An asterisk will appear alongside the project at the top of the status field as soon as you start your measurement, see Fig. 3.7. This signifies that the measurement has not been saved. It will disappear once you have saved the measurement.

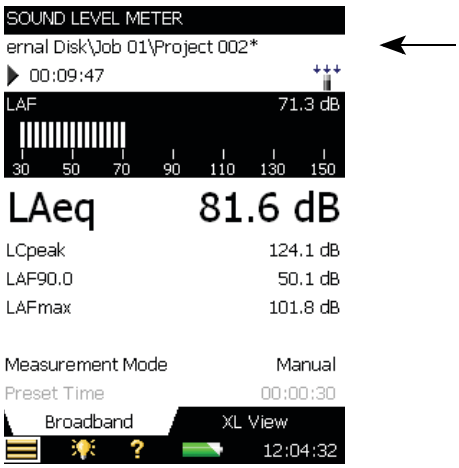
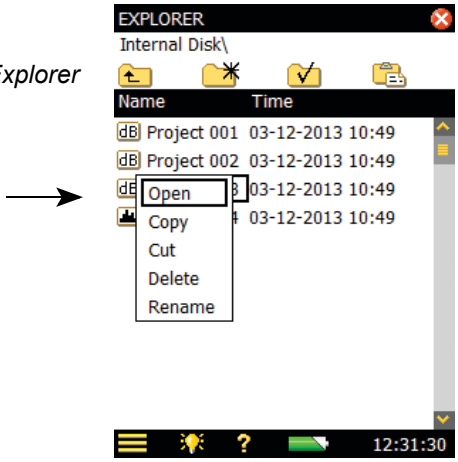


Fig. 3.7
Saving your measurement

3.4.1 Viewing the Saved Measurement

To view the saved measurement, tap the project name or the **Main Menu** icon and select *Explorer* from the list of options. Tap the name of your measurement (*PROJECT 002* in this case) and select *Open* from the drop-down that appears (Fig. 3.8). Alternatively, you simply tap the measurement icon to the left of the name to open and view.

Fig. 3.8
Viewing your measurement in Explorer



3.5 Documenting your Measurement

You can attach a note with the GPS position (requires a GPS receiver connected to the USB socket). Adding a GPS note can be done before, during or after saving the measurement by tapping the **Main Menu** icon and tapping *Add GPS Note to Cur. Measurement* in the list of options.

If a GPS receiver is connected (via USB) when you press the **Save** pushbutton, then the GPS note is automatically created with the position. Remove the GPS receiver after usage to save power.

Tap the paperclip , icon to see the GPS annotation in the project and tap the text icon in the annotation to view the GPS coordinates.

Fig. 3.9
Example of a GPS note

If you do not have a GPS receiver, but know the position (for example, from your smartphone), you can manually key in the position in the GPS note.

The GPS note is headlined "Position:", and includes the latitude and longitude. For manual entries, please enter the latitude and longitude in one of the following formats :

Degrees: *DD.dddddY DD.dddddX*

Example: 55.816730N 12.532855E

Degrees Minutes: *DD MM.mmmmY DD MM.mmmmX*

Example: 55 49.0038N 12 31.9713E

Degrees Minutes Seconds: *DD MM SS.sssY DD MM SS.sssX*

Example: 55 49 0.288N 12 31 58.278E

where *X* = E or W and *Y* = N or S. If you use degrees only, then you can use +/– instead of N/S and E/W (example: *43.08011N,79.071007W* = 43.08011,–79.071007). You can use "," instead of "space" between latitude and longitude

The GPS note can be used by Measurement Partner Suite BZ-5503 to locate the measurement on Google Maps™.

3.6 Switching Off

Switch the analyzer off by pressing ⏻. If held in for 1 second, the instrument goes into standby mode; if held in for more than 4 seconds, it switches the instrument off.

The analyzer will automatically switch off when it has been in standby mode without external power for more than 30 hours.

Chapter 4

Getting to Know Your Analyzer

4.1 What is a Sound Level Meter?

A Sound Level Meter (SLM) is an instrument that is designed to measure sound levels in a standardised way. An SLM comprises a microphone, a preamplifier, a main processor and a read-out unit. The microphone converts the sound signal into an equivalent electric signal. The electric signal that the microphone creates is at a very low level, so it is made stronger with the help of a preamplifier before it is processed by the main processor.

Processing includes applying frequency and time weightings to the signal as specified by international standards, such as IEC 61672−1, to which the analyzer conforms.

Frequency weighting adjusts how the SLM responds to different sound frequencies. This is necessary because the human ear's sensitivity to sound varies according to the sound's frequency. The most commonly used frequency weighting is A-weighting, which adjusts a signal in a way that best resembles the human ear's response at medium-range levels. A-weighting is required for nearly all environmental and workplace noise measurements, and is specified in international and national standards and guidelines. All of the analyzer's measurement parameters apply A- or B-weighting and a choice of C- or Z-weighting, except for the measurement of peak levels where a single weighting (typically 'C') is applied. In this case, C-weighting is used to take into account the energy present at low frequencies even when they are not particularly annoying.

Time weighting specifies how the SLM reacts to changes in sound pressure. It is an exponential averaging of the fluctuating signal, providing an easy-to-read value. The analyzer applies Fast, Slow and Impulse (or 'F', 'S' and 'I') time weightings, which are the required weightings according to the vast majority of international and national standards and guidelines.

The signal is processed through the weighting filters, and the resulting sound pressure level is displayed in decibels (dB) referenced to 20 µPa on the analyzer's screen. The sound pressure level values are updated at least once per second.

Assessing a fluctuating noise level means getting a value for a level that is, in simple terms, the average level. The 'equivalent continuous sound level', L_{eq}, is known around the world as the essential averaged parameter. L_{eq} is the level that, had it been a steady level during the measurement period, would represent the amount of energy present in the measured,

fluctuating sound pressure level. It is a measure of the averaged energy in a varying sound level. It is not a direct measure of annoyance, though extensive research has shown that L_{eq} correlates well with annoyance.

L_{eq} is measured directly with any SLM. If an A-weighting filter is used, it is expressed as L_{Aeq}: *the measurement of the equivalent continuous sound level using the A-weighted filter network.*

A full range of measurement parameters is given in Appendix B.

4.2 What is the Hand-held Analyzer?

The hand-held analyzer is a versatile hardware platform suitable for covering a wide range of different applications. Together with Sound Level Meter Software for 2250 Light BZ-7130, it is a Class 1 modular precision integrating-averaging sound level analyzer with an easy to use interface for quick and simple measurement setups.

4.2.1 Sound Level Meter Software for 2250 Light BZ-7130

Sound Level Meter Software for 2250 Light, BZ-7130 allows you to measure a comprehensive set of parameters used for rating noise in terms of its impact on the environmental and working environments and on occupational noise evaluation.

The more commonly used parameters, which cover a large range of applications, are either instantaneous measured parameters (available at any time) or timed measured parameters (measured within a controlled time interval):

Timed Measured Parameters

- Equivalent Continuous Sound Levels (L_{eq} – example: L_{Aeq})
- Moving (or sliding) Equivalent Continuous Sound Levels (example: $L_{Aeq,T,mov}$ and $L_{Aeq,T,mov,max}$)
- Peak Sound Levels (L_{peak} – example: L_{Cpeak})
- Maximum Time-weighted Sound Levels (L_{max} – example: L_{AFmax})
- Minimum Time-weighted Sound Levels (L_{min} – example: L_{AFmin})
- Percentile Levels (L_N – example: $L_{AF90.0}$)
- Sound Exposure Level (L_{AE})
- Sound Exposure (example: E)
- Daily Noise Exposure Level (example: $L_{ep,d}$ or $L_{EX,8h}$)
- Noise Dose (example: based on ISO standards: Dose; based on US standards: DoseS5)
- Number of Peaks (for example, #CPeaks(>140 dB))
- Time Weighted Average (for example, TWA)
- Level Average with Exchange Rates 4, 5 or 6 (example: LavS5)
- Weather data (requires a weather station connected)
- GPS data (requires a GPS device connected)

Instantaneous Measured Parameters

- Instantaneous Time-weighted Sound Levels (L_p – example: L_{AF})
- Sound Pressure Levels (max levels once per second – example: L_{AF}(SPL))
- Instantaneous Peak Sound Levels (example: $L_{Cpeak,1s}$)
- Instantaneous Weather data (requires a weather station connected)
- Instantaneous GPS data (requires a GPS device connected)

Note: See Appendix B for a comprehensive list of all parameters.

Sound Level Meter Software for 2250 Light BZ-7130 incorporates a simple user interface that is easy to learn and uses intuitive data storage and recall. Comprehensive security features mean no loss of data, even on accidental power-off. Sound Level Meter Software for 2250 Light BZ-7130 also provides connectivity between your PC and other sound analysis software.

This hand-held analyzer platform includes a range of optional software modules, that are enabled through easily activated software license keys. The combination of software modules and innovative hardware makes the instrument a dedicated solution for performing all your high-precision measurement tasks. The following optional software modules are covered in this manual:

4.2.2 Frequency Analysis Software

1/1-octave Frequency Analysis Software for 2250 Light BZ-7131

This software module allows real-time frequency measurements in 1/1-octave bands, making it a simple matter to, for example, select suitable hearing protection, qualify noise from heat and ventilation systems and assess tonality.

1/3-octave Frequency Analysis Software for 2250 Light BZ-7132

This software module allows real-time frequency measurements in 1/3-octave bands.

4.2.3 Logging Software for 2250 Light BZ-7133

This software module allows logging of broadband and spectral data* to obtain a time history for later analysis, for example, for use in environmental noise as well as workplace noise assessment. It allows free selection of up to 10 parameters to log at periods from 1 s to 24 h. Results are logged directly to the SD memory card (or CF card if using hardware versions 1 – 3).

*. Requires 1/1-octave Frequency Analysis Software for 2250 Light BZ-7131 or 1/3-octave Frequency Analysis Software for 2250 Light BZ-7132

4.2.4 Signal Recording Option BZ-7226

This option allows recording of the input signal (typically sound) in either 16-bit or 24-bit resolution during measurement. The signal recording can be controlled manually or by using an external trigger signal. The recorded signal can be played back and listened to (hardware version 4 only) using optional Earphones HT-0015. The signal is recorded directly to the SD memory cards (or CF card if using hardware versions 1 – 3).

4.2.5 Tone Assessment Option BZ-7231

This option allows the assessment of tones on-site, according to the ISO standard. When used with 1/3-octave Frequency Analysis Software BZ-7132 and Logging Software BZ-7133, it allows you to assess tones in a measured 1/3-octave spectrum according to ISO 1996:2007, Annex D.

4.2.6 Built-in Help

If you need more detailed information at any time during operation, tap the **Help** icon on the analyzer's screen. The resulting screen will explain that particular item in much more detail. You can scroll up and down the explanatory text using either the ▼ and ▲ pushbuttons, or the scroll bar on the screen. Return to the normal display screen by tapping .

If you need to view any of the previous 10 screens you have visited in the help system, tap the icon at the top of the display.

Software and Hardware Versions

Once in the help system, you can access the list of installed software versions and licenses, together with information about the hardware. This information is always available and is accessed by selecting **About** from the top of the display.

4.3 What is Measurement Partner Suite BZ-5503?

Measurement Partner Suite BZ-5503 comes standard with your hand-held analyzer and provides data archive, preview and export capabilities as well as software maintenance and remote online display. In addition to the included standard configuration, valuable data analysis and postprocessing functionality is available in an expanding suite of optional application modules.

The software enables you to do the following:

- Setup or control the analyzer from a PC
- Retrieve data from the analyzer
- Manage and archive data from the analyzer
- View data in archives
- Update the software in the analyzer
- Install licenses for use of software modules in the analyzer
- Remotely view online displays
- Post-process data (optional)
- Export to other post-processing and documentation tools like Evaluator™ Type 7820 or Microsoft® Excel® or Word

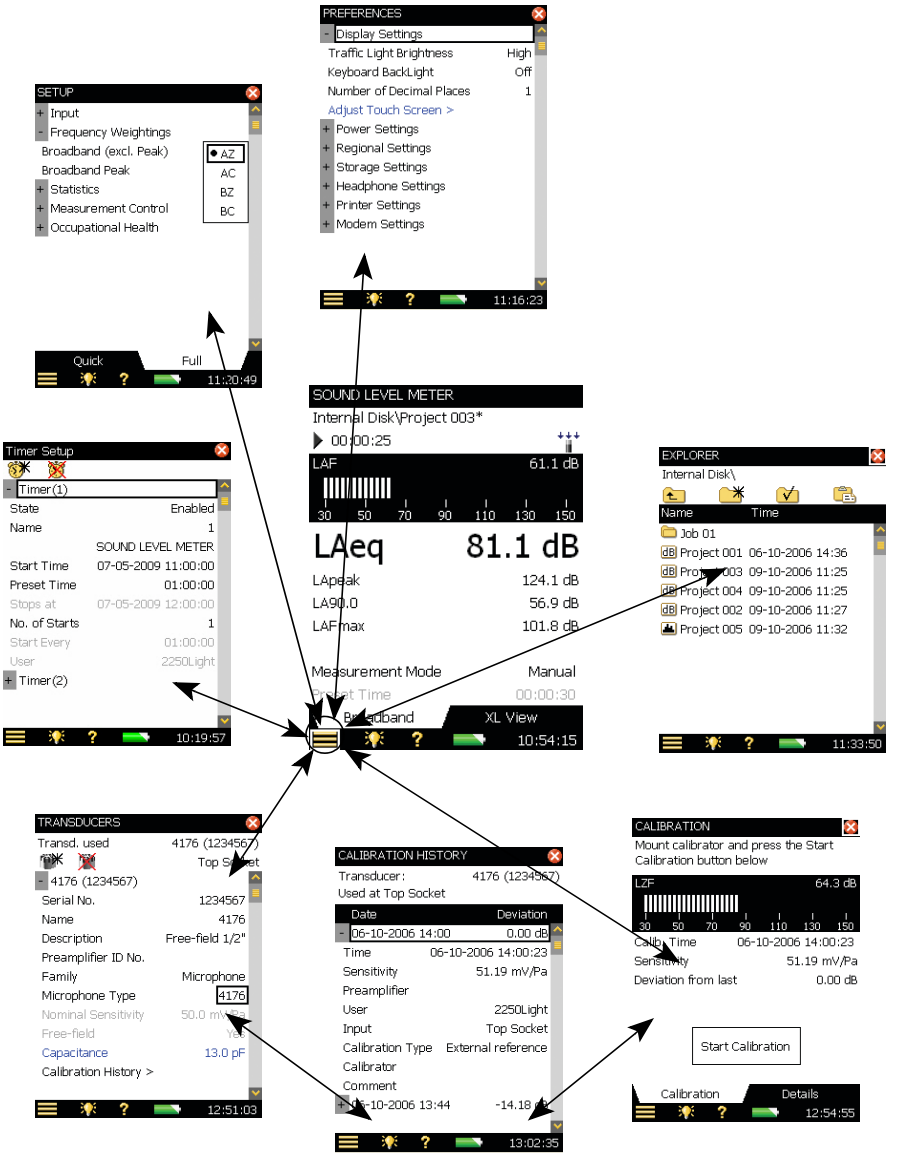
Measurement Partner Suite BZ-5503 is supplied on the Environmental Software DVD (BZ-5298), which is included with your analyzer.

4.4 Basic Principles when using 2250 Light

4.4.1 Navigation Principles – ‘Star’ Navigation Concept

The main principle is that all the main menus are accessible via a single tap of the stylus. The Main Menu icon forms the centre of the ‘star’ navigation concept, see Fig.4.1:

Fig. 4.1 *The 'Star' navigation concept*



This configuration gives you immediate access to screens you need most, that is, those you will need to perform, save and document your measurements. The **Main Menu** allows you to navigate to the following screens:

- Explorer
- Setup
- Preferences
- Transducers
- Calibration
- Timer Setup

In addition, the **Main Menu** also allows you to perform the following actions:

- Save Template
- Lock Keys and Screen

Explorer

The **Explorer** screen is accessed from the **Main Menu** or by tapping the project name and gives you access to the analyzer's Data/Project manager. This allows you to view the overall project structure, including job folders and projects, and to view all the individual measurements. When you have finished, press to return to the measurement screen.

Setup

The **Setup** screen is accessed from the **Main Menu** and gives you access to the various setup parameters, such as frequency weightings, control of the measurement, bandwidth, statistics and the type of input currently connected. You can change these as required, see section 4.4.6.

The **Full** tab at the bottom of the screen allows you to view the complete list of setup parameters, while the **Quick** tab allows you to access the more frequently used parameters. When you have finished viewing or updating the parameters, tap to return to the measurement screen.

Changes made to the setup will only be applied temporarily, i.e., until you select another project template or open another project to re-use the setup from that project. However, if you want the setup changes to be saved in the current template, select the **Save Template** option from the **Main Menu**.

Note: If you make changes to the setup that you do not want to keep (and you have not yet selected **Save Template**), you can undo them by selecting the template again from the Project Template bar at the top of the screen.

Preferences

The **Preferences** screen is accessed from the **Main Menu** and gives you access to the instrument's preferences. These include things such as regional settings, appearance of the screen, power management and language. You can change these as required, see section 4.4.6. For more information refer to section 8.1. When you have finished viewing or updating the parameters, tap to return to the measurement screen.

Transducers

The Transducers screen is accessed from the Main Menu, you can view details of the transducer connected to the instrument. Details can be changed, see section 4.4.6. When you have finished viewing or updating the details, tap to return to the measurement screen.

You can tap on the *Calibration History* link at the bottom of the transducer details and open the *Calibration History* screen, see Fig.4.1. This screen includes the calibration history for the microphone. When you have finished viewing or updating the details, tap to return to the Transducers screen.

Calibration

The Calibration screen is accessed from the Main Menu, and gives you access to the instrument's calibration procedure. To calibrate the instrument, follow the instructions in the status field. For more information refer to section 5.2. When you have finished calibrating or viewing the details, tap to return to the measurement screen.

The **Calibration** tab at the bottom of the calibration screen allows you to perform and monitor the calibration, while the **Details** tab allows you to view the details of the calibration and the calibrator that are being used to calibrate the analyzer. While you are viewing the **Details** tab, you can tap on the *Calibration History* link at the bottom of the calibration details and open the Calibration History screen (Fig.4.1). This screen includes the calibration history for the currently selected transducer, tap to return to the Calibration screen.

Timer Setup

The *Timer Setup* is accessed from the Main Menu and enables you to control the analyzer via one or more of the analyzer's timers. The purpose of a timer is to initiate measurements in the absence of an operator. When you have finished, tap to return to the measurement screen.

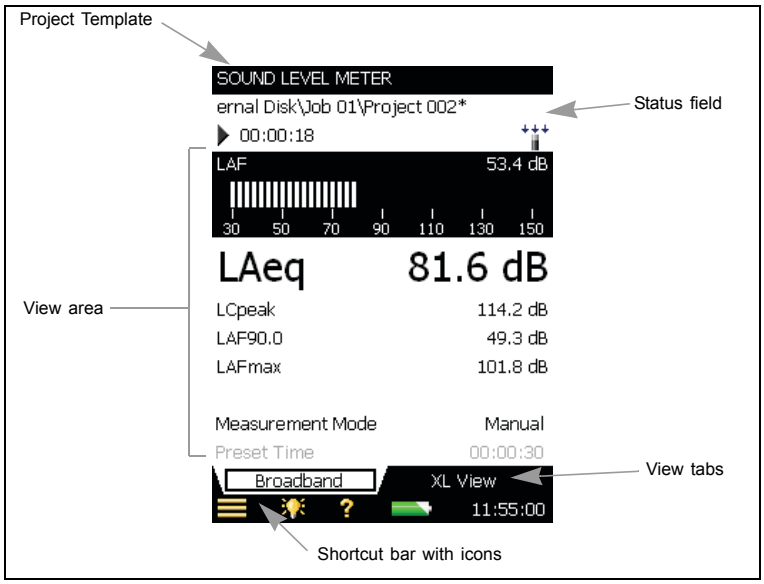
4.4.2 The Display Screen

During normal operation, you will use the display screen to view your measurements and carry out a variety of functions, which are described in the following sections.

CAUTION: The touch-sensitive screen is susceptible to damage from sharp objects, such as pencils, fingernails, etc. We therefore recommend you use the stylus provided to activate items on screen. See also section 4.4.5.

A typical screen is shown in Fig.4.2.

Fig. 4.2
Typical screen when making a measurement



The main areas, starting at the top of the screen, are:

- Project Template
- Status Field
- View Area (with view tabs)
- Shortcut Bar

Project Template Bar

This bar displays the name of the Project Template, which contains all the screen settings and measurement setup for the current project. Tap on the text to open a drop-down list containing all the available templates. If you make any changes to the setup in a template an '∗' will appear next to the template name to indicate that the new settings have not been saved. Select **Save Template** from the **Main Menu** to save the settings in the current template.

Status Field

The area just below the Project Template bar is called the Status Field. Depending on the template, this field displays status information using up to three lines of text, as follows:

First Line:

- Path and name of the current project (see section 6.1.1). Tap it to open the Explorer. To change the path, navigate to the desired job (path) and tap the icon to save this path as the default measurement path. As in the project template, an '∗' will appear next to the project name to indicate that the project has not been saved. Press the **Save** pushbutton if you want to save the measurement or changed settings.
- Smiley (if applicable)
- The **PC** icon indicates connection to a PC

Second Line:

- Measurement state represented as icons: Stopped ■, Running ▶ and the Paused icon ❙❙
- Elapsed time of the measurement
- Feedback on the action of pressing the following pushbuttons: **Reset**, **Back-erase**, **Start/Pause** and **Save**
- Indication that the measurement microphone is not calibrated. In this case the word *Uncal.* appears in the Status Field
- Four icons are used to represent whether, or not, a windscreen is fitted and whether you are measuring in a free-field or diffuse field. For example, no windscreen fitted, measuring in a free-field – ; no windscreen fitted, measuring in a diffuse field – ; windscreen fitted, measuring in a free-field – ; windscreen fitted, measuring in a diffuse field –
- Immediate textual feedback on overload/underrange situation and latched overload indicated with an **Overload** icon

Third Line: Used for Logging. See “Status Field” on page 101.

View Area

The View Area contains the screens required for a particular measurement, such as bar graphs, result readouts and various frequently used setup parameters (that is, *Meas. mode*). The template defines the content of this area. More than one screen can be used for displaying the information. Select the screen using the View Tabs at the bottom of the View area.

Changes made to the screens will only be applied temporarily, that is, until you select another project template or open another project to re-use the screen from that project. However, if you want the screen changes to be saved in the current template, select the **Save Template** option from the Main Menu .

Note: If you make changes to the screen that you do not want to keep (and you have not yet selected **Save Template**), you can undo them by selecting the template again from the Project Template bar at the top of the screen.

Shortcut Bar

The Shortcut Bar, at the bottom of the screen, displays a number of fixed icons that are always accessible. These include:

- **Main Menu** icon , gives access to the Main Menu. This allows you to navigate to a specific function, see description earlier under Navigation Principles
- **Backlight** icon , allows you to select a backlight level
- **Help** icon , a quick way to get context-sensitive help from any screen by tapping on the icon at the bottom. Closing the help window will return you to the previous screen
- **Battery/power Status** icon , shows the condition of the battery. All green shows a fully charged battery, while red means power levels are low. Tap the icon to get more details of the battery condition. (When the Power Supply lead is connected, the icon will be displayed in place of the **Battery/power Status** icon .)
- The clock in the lower right corner displays the current time. Tap the readout to get details of the time and date, or to set the clock

4.4.3 Use of Pushbuttons for Controlling Measurements

The design of the analyzer is such that the layout of the pushbuttons has been optimised for single-handed operation.

Reset Pushbutton

Use the **Reset** pushbutton to reset a measurement, i.e., to reset all detectors, averagers, maximum and minimum hold, etc. If the measurement is paused (that is, **Paused** icon ‖ is displayed in the status field*)*, then the measurement reverts to a 'stopped' state after a reset, (that is, **Stopped** icon ■ displayed with a zeroed readout). If the measurement is running, then the measurement will be automatically re-started after the reset.

Start/Pause Pushbutton

Use the **Start/Pause** pushbutton for controlling the measurement. The function of this key depends on the current measurement state, see Table 4.1.

Table 4.1
Start/Pause pushbutton functions

Current Measurement State	Function of Start/Pause Pushbutton	Next Measurement State
■ Stopped	Start the measurement	▶ Running
▶ Running	Pause the measurement	‖ Paused
‖ Paused	Continue the measurement	▶ Running

Save Pushbutton

Use the **Save** pushbutton to save the measurement data together with the current project template (including all the screen settings and setup information) and the calibration documentation.

Pressing **Save** will affect the pause and running states. In both cases the measurement state will be 'stopped' shortly after pressing the pushbutton (**Stopped** icon ■ displayed).

Back-erase Pushbutton

For BZ-7130, BZ-7131 and BZ-7132 Software:

Use the **Back-erase** pushbutton to erase the last 5 seconds completely from the measurement. (This includes, of course, overload indications you would like to erase.)

If used when the current measurement is running, then the measurement will be paused. The status field displays *Pause, Back erase* briefly, and then displays the shortened elapsed time along with the Paused icon ‖.

For BZ-7133 Software:

Pressing the **Back-erase** pushbutton will start drawing an Exclude Marker on the display, see section 11.3.2. Pressing it again will stop drawing the marker on the display (toggle function).

4.4.4 On-screen Feedback and Traffic Light

Feedback is given on screen in the Status Field, see Fig.4.2, and the Traffic Light indicates important states of the instrument, see Table 4.2:

Table 4.2
Traffic Light Indications

State	Light Scheme
During power-on or loading template	Nothing
■ Stopped. Ready to measure	Short yellow flash every 5 s
▶ Awaiting trigger, searching for calibration signal	Short green flash every second
▶ Running measurement, everything OK	Steady green light
❙❙ Paused. Measurement not saved	Slow yellow flash on 1/2 s, off 1/2 s
▲ Overload	Fast red flash

4.4.5 Use of Stylus and Navigation Pushbuttons

The stylus and navigation pushbuttons are used for setting up 2250 Light, navigating through the screens and managing the results.

A number of items that appear on the screen (parameter values or icons) can be selected, updated and activated. For instance, a new parameter value can be selected from a drop-down list.

The selection and activation of items on the screen can be done in two ways:

- Tapping once on the item on the screen will select and activate it, or
- Moving the field selector around using the navigation keys until the item you want is highlighted, then pressing the **Accept** pushbutton (✓) to activate it

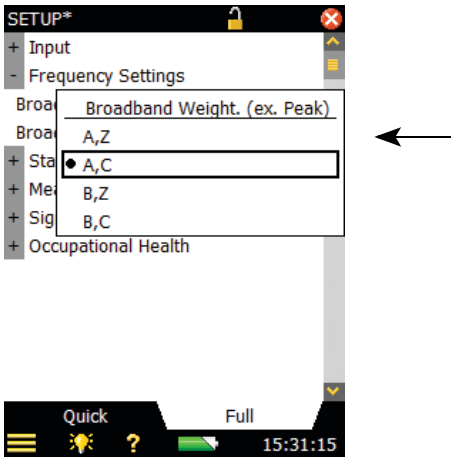
You can choose to use the stylus or the pushbuttons, depending on your preference and the measurement situation. For instance, if the amount of noise generated by the instrument needs to be kept to an absolute minimum, consider using the pushbuttons rather than the stylus – this is because tapping of the stylus on the touch-sensitive screen may create extra noise. However, if speed is of major importance, the stylus can navigate through the setup and measurement screens quicker.

Throughout the manual we have described how to perform the measurement procedures using the stylus only, but you may also use the alternative method (using the Navigation and Accept pushbuttons) if you prefer.

4.4.6 How to Change Parameter Values

Most parameter values are changed by selecting a new value from a drop-down list, which appears when the parameter field is selected. See the example in Fig.4.3.

Fig. 4.3
Changing parameter values



Stylus Usage

Tap on the value you want in the drop-down, or tap outside the list to cancel the selection.

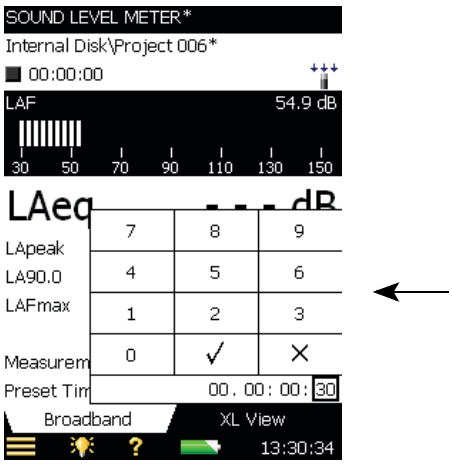
Pushbutton Usage

Use the navigation pushbuttons (**Up Arrow** ▲, or **Down Arrow** ▼) to select the value you want and press the **Accept** pushbutton ✓ to activate it. Use the **Left Arrow** ◄ to cancel the selection.

Number Keyboard

When activating a number, a number keyboard appears, see Fig. 4.4.

Fig. 4.4
Number keyboard

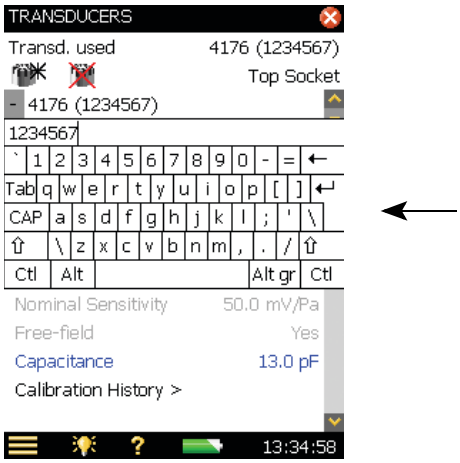


Tap on the digits or use **Up Arrow** ▲/**Down Arrow** ▼ to increment/decrement the number. Use **Left Arrow** ◄/**Right Arrow** ► to select other digits if necessary. Press the **Accept** pushbutton ✓ or tap ✓ on the number keyboard to enter the number for the parameter. Tap ✕ on the number keyboard, or outside the number keyboard to cancel the change of value.

Character Keyboard

When activating a text value, a standard full character keyboard appears on the screen (Fig. 4.5).

Fig. 4.5
Character keyboard



The character keyboard has all the functionality of a normal keyboard, enter text as required by tapping the individual keys with the stylus. Tap the ↵ to accept the changes, or tap outside the keyboard to cancel.

You can lock your settings, to prevent accidental changes, by tapping on the padlock icon on top of the screen. To unlock tap on the padlock icon again.

When locking the template you get the option of password protecting the lock. If you choose this, then you enter a password.

4.4.7 Locking the Pushbuttons and Display

The pushbuttons and display can be locked to prevent inadvertent operation:

- **To Lock:** Select the *Lock Keys and Screen* option from the **Main Menu** .
- **To Unlock:** Press the **Left Arrow** pushbutton ◄, followed by the **Right Arrow** pushbutton ►, then the **Accept** pushbutton ✓.

If you attempt to press a pushbutton, or tap the screen, while the analyzer is locked, an information window pops up with instructions on how to unlock it.

Chapter 5

Calibration

5.1 Introduction

Calibration is an adjustment of your sound level meter to measure and display correct values. The sensitivity of the microphone as well as the response of the electronic circuitry can vary slightly over time, or could be affected by environmental conditions such as temperature and humidity. While you are unlikely to ever experience a large drift or change in sensitivity with the analyzer, it is nevertheless good practice to perform regular calibrations, normally before and after each set of measurements. Often calibration is required by measurement standards, such as IEC 61672−1.

If you want your analyzer to remind you when the next Accredited/Traceable calibration is due, you can set it up on the **Reminder** tab of the Calibration screen. See section 5.6.

You can check the complete measurement chain during long-term measurement using Charge Injection Calibration. See section 5.7.

5.2 Calibration Types

Acoustic Calibration

Acoustic calibration is the preferred calibration method, particularly when standards and regulations require calibration before a measurement. The method involves applying an acoustic signal of known magnitude and frequency to the microphone, which calibrates all the instrument's components (microphone, preamplifier and electrical circuitry).

Electrical Calibration

If no sound level calibrator is available (or a known amplification is introduced, i.e., by analyzing a tape recorded signal) then you can type the sensitivity directly into the *Sensitivity* field. The analyzer will be regarded as uncalibrated, and the text '*Uncal.*' will appear in the status field.

Manual Calibration

If no calibrator is available (or a known amplification is introduced, e.g., by analysing a tape recorded signal) then you can type the sensitivity directly into the *Sensitivity* field. The analyzer will be regarded as uncalibrated and the text '*Uncal.'* will appear in the status field.

Charge Injection Calibration

You can check the complete measurement chain during long term measurement using Charge Injection Calibration. See section 5.7.

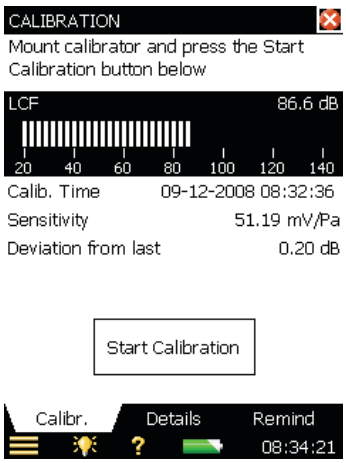
5.3 Standard Calibration

To perform the acoustic calibration use Sound Calibrator Type 4231. It provides a stable sound pressure at 1 kHz and has minimal susceptibility to environmental factors. The procedure itself is relatively simple, and on the analyzer the procedure is referred to as the Standard Calibration procedure.

The procedure for performing an acoustic calibration and instructions on how to fit the calibrator are given below:

1) Stand away from loud sound sources that may interfere with the calibrator's signal.
2) Switch on the analyzer: push ⏻.
3) Tap the **Main Menu** icon ☰ then *Calibration* to open the Calibration screen (Fig.5.1).

Fig.5.1
Calibration screen



This screen contains a bar graph showing the actual sound pressure level and three placeholders for displaying information about the last calibration.

4) Following the first part of the instruction in the Status Field, fit Sound Calibrator Type 4231 carefully onto the microphone of the analyzer. (To avoid handling vibrations

that disturb the calibration, rest the assembly in a roughly horizontal position on a table or other flat surface.)

Ensure that the calibrator fits snugly on the microphone.

5) Switch on the calibrator. Wait a few seconds the level to stabilise.

6) Tap the Start Calibration button on the screen to start the calibration.

Note: *Detecting level...* appears on the screen as feedback.

7) While the analyzer is searching for the calibration signal and the signal level is stabilising, the 'traffic light' indicates a short green flash every second. When the level is stable, the traffic light indicates a steady green and the signal is measured and used for calibration. **Once the calibration has been completed successfully, the traffic light indicates a short yellow flash every 5 seconds.** The *Sensitivity* is automatically calculated and displayed in a pop-up together with the deviation from the last calibration. Tap *Yes* to accept and use the new sensitivity and save it in the calibration history. Tap *No* to disregard the new calibration and continue with the old calibration.

If the calibration deviates more than ±1.5 dB from the initial calibration, then the calibration is stopped without changing the calibration of the instrument. The traffic light will indicate a fast flashing red and an error description will appear in the status field.

Hint: If the microphone is separated from the analyzer using a microphone extension cable then place the analyzer so it can be seen from the location of the microphone. Start the calibration process, (select the Calibration screen and tap the Start Calibration button on the screen, then go to the microphone and fit the Calibrator onto the microphone, switch on the calibrator and monitor the traffic light on the analyzer, as discussed previously.

8) Once you have completed the calibration, tap the Exit Calibration button and remove the calibrator. It will automatically switch off after a few seconds.

5.3.1 Calibration Settings

Select the **Details** tab on the Calibration screen to view the calibration details, see Fig. 5.2.

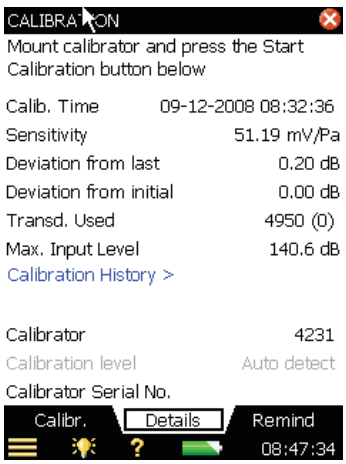


Fig. 5.2
Calibration details screen

This screen displays the following information:

- Details of the last calibration: date, sensitivity, deviation from last calibration and deviation from initial calibration
- The connected transducer: type and serial number

  Note: Select a new transducer by tapping on the **Main Menu** icon and selecting *Setup*, followed by *Input*)
- A *Calibration History* link: provided to enable you to view a history of transducer and calibration settings, see below
- *Max. Input Level*: the maximum sinusoidal input level measured without overload indication

The calibration settings can be adjusted as follows:

- *Calibrator*: select between Type 4231 and a custom calibrator
- *Calibration Level*: Enter the specific level of your custom calibrator. If you are using, Type 4231, calibrator level is automatically detected, (shown as *Auto detect*)

  Note: The *Auto detect* setting enables the automatic detection of the calibration level. For free-field microphone types (like Type 4950) the calibration level from Sound Calibrator Type 4231 is either 93.85 dB or 113.85 dB. For diffuse- or pressure-field types, the calibration level is either 94 dB or 114 dB. The calibration process automatically determines the correct level
- *Calibrator Serial Number*: type in the serial number for your calibrator. The calibrator will be documented in the calibration history

5.4 Calibration History

To view calibration history, tap *Calibration History* > on the Calibration Details screen (Fig. 5.2).

The analyzer saves the last 20 calibrations, plus initial calibration, which can be viewed on the Calibration History screen (Fig. 5.3). Tap to return to the calibration details screen; tap again to return to the Measurement screen.

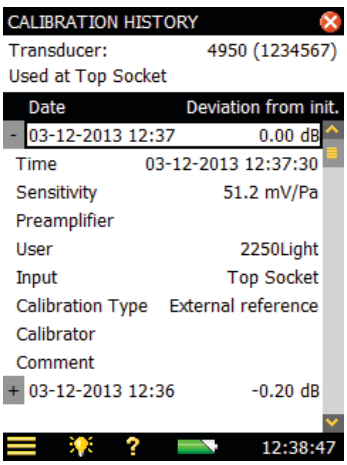


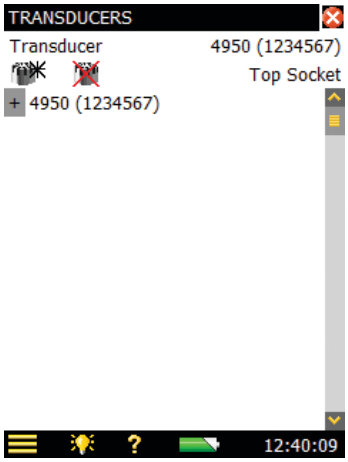
Fig. 5.3
Calibration History screen

5.5 Transducer Database

The specifications for Microphone Type 4950 (and Preamplifier ZC-0032), which comes fitted in the top socket of the analyzer, are described on the Transducers screen.

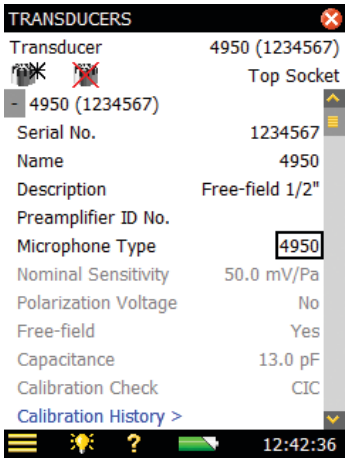
1) Tap the **Main Menu** icon then *Transducers* to open the Transducer screen (Fig. 5.4).

Fig. 5.4
Transducers screen



2) Tap on the transducer name/number, or select the **Plus** icon + next to name/number, to view the details in the database, see Fig. 5.5.

Fig. 5.5
Details of the microphone



You can add other microphones by tapping on the **Add New Microphone** icon, selecting *Microphone* from the drop-down list and filling in the details of your particular microphone.

All the details for the microphone can be found on the screen.

Type 4950 is the default entry. Change *Microphone Type* if you are using a different Type. For known microphone types, a number of parameters are automatically set.

Note: For Type 4950 the parameters *Nominal Sensitivity*, *Free-field* and *Capacitance* are set automatically. See details in Appendix C. The analyzer can then make sound field corrections and windscreen corrections as specified in the setup. To confirm which type of correction is being applied, an icon is displayed in the measurement Status field. If the microphone is unknown to the analyzer, no corrections can be made and no icon appears in the Status field. The parameters mentioned above have to be set manually (that is, typed in). We recommend that you insert the value for Nominal Sensitivity directly from the calibration chart. Nominal Sensitivity is used in the automatic level detection calculations, when calibrating using Sound Calibrator Type 4231, to determine whether the level is 94 or 114 dB.

In the top line of the status field you can select which transducer is currently connected to the analyzer. This can also be done via the **Setup** screen by selecting *Input,* then selecting the transducer in the *Transducer Used:* field.

At the bottom of the parameter list you can select the calibration history for the currently selected transducer by tapping on the *Calibration History* link. See section 5.4 and Fig. 5.2.

When you have finished, tap to return to the measurement screen.

5.6 Calibration Reminder

The Calibration Reminder tab, see Fig. 5.6, allows you to keep track of when you need to run your next Accredited/Traceable calibration, and shows you the date of your last calibration.

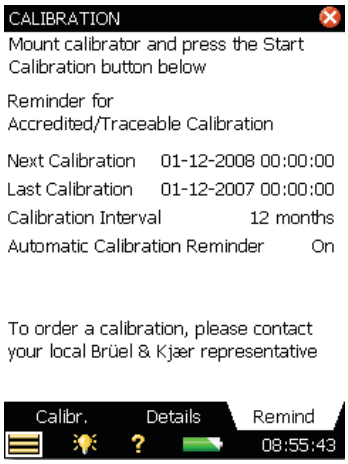
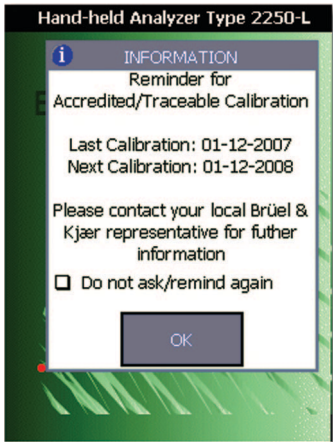


Fig. 5.6
Calibration reminder tab

The automatic calibration reminder facility will pop-up a reminder approximately 2 months before your next calibration is due and keep on reminding you every week until you do one of the following actions:

- Send your instrument for Accredited/Traceable Calibration and update the *Last Calibration* date
- Check the '*Do not ask/remind again*' checkbox in the reminder pop-up (see example in Fig. 5.7)
- Disable the automatic calibration reminder

Fig. 5.7
Reminder pop-up



You can set the *Calibration Interval* parameter to either *12 months* or *24 months* depending on your local requirements.

You can disable the facility by selecting the *Automatic Calibration Reminder* parameter to *Off*.

5.7 Charge Injection Calibration

5.7.1 Theory of Charge Injection Calibration

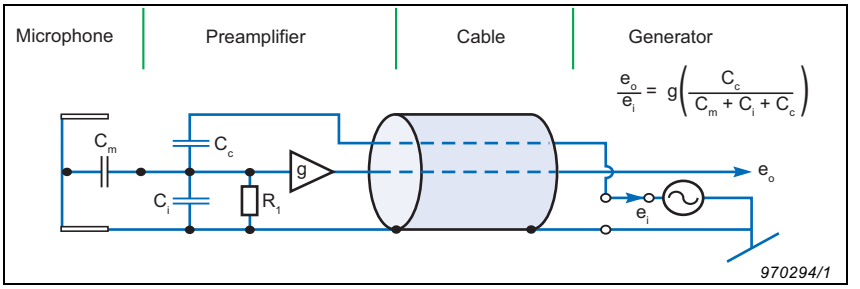
If an external sound source is not available, for example during short or long term monitoring, you can check the calibration of the analyzer using the Charge Injection Calibration (CIC) facility. This is done automatically during a logging measurement (see section 11.2). Unlike an internal calibration, the Brüel & Kjær patented CIC technique enables a complete measurement chain to be verified, including the microphone, the preamplifier, the cabling and the analyzer. Each verification measurement is compared to an initial reference measurement.

As the name implies, the method uses injection of charge into the microphone and preamplifier input circuit, and the ratio between the measured signal and the injected signal is measured (CIC Ratio), see Fig. 5.8.

The method is based on detection of changes in impedance at the input terminal. It was developed for monitoring of microphone channels and requires a preamplifier with a small, extremely stable, built-in capacitor which makes it possible to apply an electrical signal to the preamplifier (and microphone) input terminal.

A stable CIC Ratio means a 'healthy' system and assures stable operation of microphone, cable, preamplifier and the remaining measurement system.

Fig. 5.8 *Charge Injection Calibration. Low-leakage resistance capacitor C_c is set in parallel with the microphone and fed with voltage e_i. The ratio e_o / e_i is constant when g, C_c, C_m and C_i are constant. Changes to preamplifier gain (g), cable parameters, microphone capacitance (C_m), etc., will change e_o / e_i, and hence indicate probable changes in calibration*



5.7.2 Performing a Manual Charge Injection Calibration with the Analyzer

Charge Injection Calibration is only available with Logging Software BZ-7133.

Tap the **Main Menu** icon and select *Calibration* from the list. Click the *CIC* tab to view the various CIC parameters that are available. These include the results of the latest manual CIC, together with the reference, see Fig. 5.9.

The status field at the top of the screen informs you how to perform the CIC.

Press the *Start CIC* button to start the CIC. After approximately 10 s you will see the result.

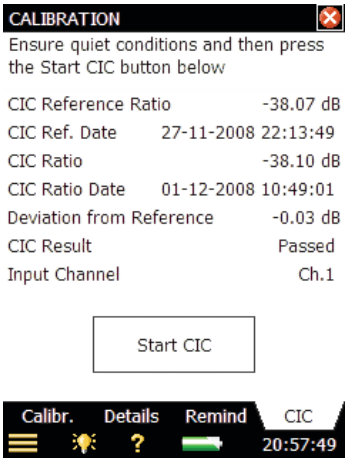
Normally, the *CIC Reference Ratio* is set the very first time a CIC is performed, however, you should update the *CIC Reference Ratio* if you change the microphone preamplifier. You do this by checking the *Use as new Reference* checkbox.

The *CIC Reference Ratio* and *CIC Ref. Date* parameters display the results of the very first manual CIC, and this will be used as the 'reference' for all subsequent CIC Ratio measurements.

Note: Each microphone in the transducer database has a CIC Reference Ratio.

If the *CIC Ratio* parameter deviates by more than 0.5 dB from the *CIC Reference Ratio*, then there may be a problem, and this should be investigated.

Fig. 5.9
CIC Calibration tab



The result of the Charge Injection Calibration consists of four parameters:

- CIC Ratio
- CIC Ratio Date
- Deviation from Reference
- CIC Result

The CIC Result can be either: '*Passed*', '*Background noise too high*' or '*CIC Ratio deviates from Ref.*'

Chapter 6

Data Management

6.1 Organising Measurements

6.1.1 Description of Jobs and Projects

When saving a set of measurement results, they are organised together with setup information, calibration information, annotations and signal recordings in a project.

A project contains the following:

- Measurement results:
  - Broadband values (for example, L_{Aeq}, L_{AFmax}, L_{AFmin}, etc.)
  - Frequency spectra (if 1/1-octave or 1/3-octave Frequency Analysis Software for 2250 Light, BZ-7131/32 are enabled on your analyzer and you have selected a Frequency Analyzer template)
- Weather and GPS data
- Measurement Setup
- Display Setup (parameters you have selected)
- Information on the microphone
- Calibration
- Signal Recordings (attached to measurements as required)

The Project name is automatically created by combining the Project Name Prefix with a number (starting from 001), that is, Project 001 for the first project, Project 002 for the next, and so on.

If preferred, the Project Name Prefix can be changed from the default name of ‘Project’. To do this, tap the **Main Menu** icon , then *Preferences > Storage Settings* to reveal the Project Name Prefix. Tap on the current name to reveal a keyboard for you to type in the required name.

Projects are saved in folders which are called ‘jobs’ on your analyzer. These are similar to folders in the Windows® filing system.

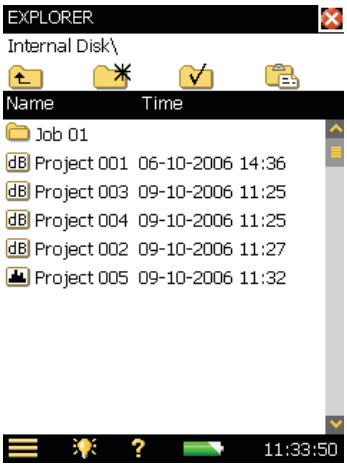
Jobs can be created in the internal memory, on a Secure Digital (SD) Card, on a USB memory stick (hardware version 4 only), or for hardware versions 1 – 3, on a Compact Flash (CF) Card.

6.1.2 Navigating in Jobs

A results browser, called Explorer, is used to navigate through the jobs and projects.

To view all jobs and projects, tap the **Main Menu** icon and select *Explorer* from the list of options. A screen similar to Fig. 6.1 will appear.

Fig. 6.1
The Explorer screen



The example from Explorer in Fig. 6.1 displays a list of jobs and then some projects, which have not been stored under a job name.

The topmost line in the status area (*Internal Disk* in the example in Fig. 6.1) shows the location in the memory.

The next line in the status area contains 4 icons for navigation.

Tap the icon to go up one level in the job-levels. The top level is the Memory level, where physical memory devices can be selected. You can select:

- With Hardware Versions 1 – 3:
  - *Internal Disk*
  - *SD-Card* (if a card is inserted in the SD slot)
  - *CF-Card* (if a card is inserted in the CF slot)
- With Hardware Version 4:
  - *Internal Disk*
  - *SD-Card B* (if a card is inserted in the bottom SD slot)
  - *SD-Card T* (if a card is inserted in the top SD slot)
  - *USB-Mem* (if a memory stick is inserted in the USB Standard A socket)

To go down one level (that is, exit the Memory level), you tap on the job name (*Internal Disk* in this case) and select *Open* from the drop-down list – or you simply tap on the memory icon next to *Internal Disk*.

Tap the icon to create a new job folder. The first job folder name will be 'Job 01', subsequent job folders will be labelled 'Job 02', 'Job 03', etc. You can rename the job folder name by tapping on the name and selecting *rename* from the drop-down list. Use the keyboard to key in a new name – accept by tapping on the Enter key ↵.

To go down one level (open a job), you tap on the job name in the list and select *Open* from the drop-down list – or you simply tap on the job icon to the left of the job name.

You can move a job/project (and its content) to another job by tapping the job name/project name and selecting *Cut* from the drop-down list. Then navigate to the job you want as the new holder of the moved job/project and tap on the Paste icon, or navigate to the level above and tap on the job name and select paste from the drop-down list.

In order to copy a job/project do as described above, but use *Copy* instead of *Cut* from the drop-down list.

Select *Delete* from the drop-down list in order to delete the job/project and all of its contents.

You can select more than one job/project for copy, cut or delete by tapping and holding the stylus on a job/project name and then dragging the stylus up or down to select other jobs/projects.

6.2 Selecting Default Measurement Job/Path

Tap the icon to select the current job as the default measurement job, where all projects will be saved when you press the **Save** pushbutton. The job name, followed by the current project name, will appear in the topmost line in the status area to confirm which job you have selected.

6.3 Recalling Measurements

You can display the measured results or re-use setups from previously saved projects, or view logged data as a profile, use the *Open* command in Explorer – this will recall the project template (display settings and measurement setup used on the saved results) along with the results. This will, however, stop and reset the current measurement

6.3.1 Viewing Data and Re-using Setups from Projects

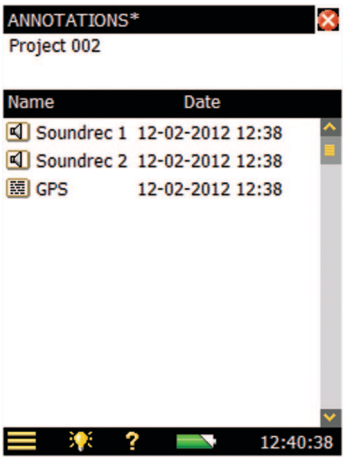
Use Explorer to locate the project with the setup you want to re-use, then tap on the project name and select *Open* from the drop-down that appears. This will stop and reset the current measurement and load the project including all setups and data. You are now using the same screens as the ones you were using just before you saved the data. Use the screens to browse the results. Pressing **Start/Pause** will start a new measurement using the setups from the project.

You can save the setup information in a template by tapping the **Main Menu** icon and selecting *Save Template*.

6.3.2 Viewing or Listening to Annotations

Use Explorer to locate the project with the annotations you want to view/hear, then tap the project name and select *Annotations* from the drop-down that appears (or simply tap the **Annotations** icon and select the **Annotations** tab. This will show all annotations attached to the project (Fig.6.4.)

Fig. 6.2
Example of annotations attached to a project



The **Loudspeaker** icon represents a signal recording. With hardware version 4, you can tap the annotation name and select *Play* from the drop-down that appears (or tap the icon) to play the recording using the headphone output.

Note: You can also rename or delete annotations, or copy or move annotations to other projects.

The **Text** icon represents a GPS note. Tap the annotation name and select *Open* from the drop-down that appears (or tap the icon) to open the **Notes Editor**. View the note and, if required, edit the note using the simulated keyboard that appears at the bottom of the screen.

Tap to accept the changes and return to the previous screen.

Chapter 7

Connection to PC or Smart Phone

7.1 Introduction

You can connect to your analyzer from a PC or smart phone in a number of different ways using a wide range of different connection types:

- Use Measurement Partner Suite BZ-5503 for full control of the analyzer – see section 7.2
- Use an Internet browser for online display and control of the analyzer – see section 7.4

Two different methods are available for connecting to the analyzer:

- USB: BZ-5503 connects to the analyzer through a USB cable
- Network: The analyzer is connected to a network (local or Internet) via a modem, LAN cable or a wireless LAN adaptor. BZ-5503 or an Internet browser will then be able to connect to the analyzer through TCP/IP using the analyzer's (global) IP address

In addition to connecting to the analyzer, the analyzer itself can notify you by SMS, or email, based on various conditions – see section 8.4.

Table 7.1 gives you an overview of the different connection possibilities including links to relevant chapters with more details.

Table 7.1 *Connection overview*

Connect from	Connection Type	Settings in Preferences	Available Notifications
BZ-5503	USB	Modem = *Disabled* see section 8.2.	–
BZ-5503, Internet Browser or Smart Phone with Internet Browser	Network GPRS/EDGE/HSPA modem	Modem = *GPRS/EDGE/HSPA Dialup* Settings in Dialup Networking. Network Settings. Possibly settings in DynDNS. see section 8.2 and 8.3.	Email see section 8.4
BZ-5503, Internet Browser or Smart Phone with Internet Browser	Network Ethernet cable	Modem = *Disabled* Possibly settings in DynDNS. Network Settings. see section 8.2 and 8.3.	Email see section 8.4
BZ-5503, Internet Browser or Smart Phone with Internet Browser	Network CF WLAN (versions 1 – 3 only) SD WLAN (G4 only)	Modem = *Disabled* Possibly settings in DynDNS. Network Settings. Settings in Wireless Network. see section 8.2 and 8.3.	Email see section 8.4
BZ-5503, Internet Browser or Smart Phone with Internet Browser	Network DSL Modem/Router	Modem = *Disabled* Possibly settings in DynDNS. Network Settings. see section 8.2 and 8.3.	Email see section 8.4

Note: The on-line help for BZ-5503 contains additional information on how to connect an instrument using the different connection types.

7.2 Transferring Measurement Data to Your PC

Measurement Partner Suite BZ-5503 is used for communication between your PC and analyzer.

You can use this software to:

- Transfer measurement data and templates from the analyzer to your PC, and vice versa
- View data
- Organise data on the analyzer
- Create users on the analyzer
- Upgrade software on the analyzer
- Install software licenses on the analyzer

Using this software, measurements on the analyzer can be controlled from your PC and displayed online, using the same user interface on the PC as on the analyzer.

Data transferred to the PC are organised in archives. You can view the measurement data in the archives.

7.2.1 Connect to Your PC

Connect the analyzer to your PC using one of the following:

- Hardware versions 1 – 3:
  - The supplied Mini USB Cable AO-1476
  - A modem connection
  - A LAN connection via a CF card adaptor
- Hardware version 4 (G4):
  - The supplied Micro USB Cable AO-1494
  - A modem connection
  - A LAN connection

The connection can be protected by requiring a login with user name and password – see settings in section D.10.

See Chapter 8 for descriptions on how to set up your preferences, including PC connections.

7.3 Post-processing and Reporting

Use the optional modules of the Measurement Partner Suite for data analysis and post-processing. For example, data in the archives can be post-processed directly in the Logging Module BZ-5503-A or Spectrum Module BZ-5503-B. Furthermore, data can be exported to various post-processing tools like Evaluator™ Type 7820 for assessing environmental noise, Protector™ Type 7825 for assessing workplace noise, or Microsoft® Excel®.

Signal recordings can be imported to Brüel & Kjær's PULSE™ Multi-analyzer platform for further analysis.

For more information on Measurement Partner Suite BZ-5503 and the PULSE multi-analyzer platform, see our website at www.bksv.com or contact your local Brüel & Kjær representative.

For further information, please refer to the on-line help included with the relevant PC Software. This software is supplied on the Environmental Software DVD (BZ-5298), which is included with your the analyzer.

7.4 Internet Browser for Online Display and Control of the Analyzer

When the analyzer is connected to a network (see Fig. 7.1) you can connect to the analyzer from a PC or smart phone using an Internet browser supporting Java Scripts.

Analyzer Settings

You access preferences by tapping on the **Main Menu** icon and selecting *Preferences* from the list of options (the screen shown in Fig. 8.1 will appear).

Tap on *Remote Access Settings*, or select the plus icon next to *Remote Access Settings* and set the *Web Server* Parameters to *Enabled.* Define sets of Usernames and Passwords:

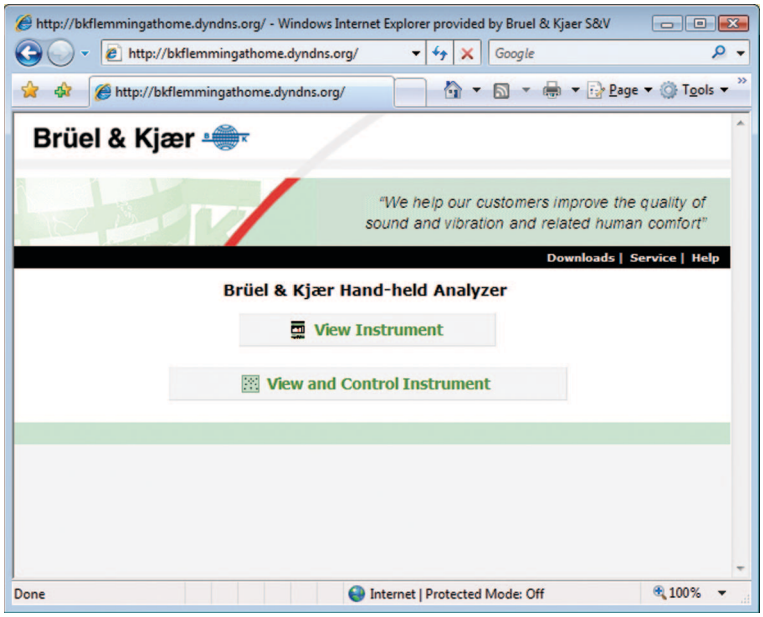
- one set for guest use (view only)
- one set for administrator use of the instrument (view and full control)

See section 8.5 and Table D.10 for more details.

Connect to Analyzer

When you enter the IP address or Hostname of the analyzer (see section 8.2. and 8.3) in the address or location bar of the Internet browser, the following screen appears

Fig. 7.1
2250 home page

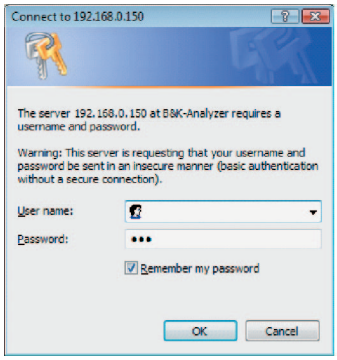


Click the **Help** link to get more detailed help on using the web page. Press the **Service** link for updating the software or for rebooting the analyzer.

Click the **View Instrument** button to enter the web page for viewing the instrument only. You might be prompted for the *Guest Username* and *Guest Password* defined for the web server (see section 8.5).

Click the **View and Control Instrument** button to enter the web page for full access to the instrument. You will be prompted for the *Username* and *Password* defined for the web server.

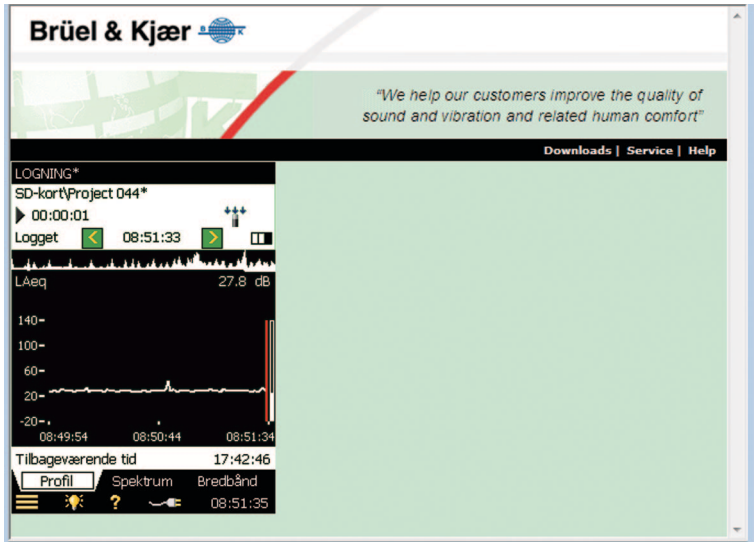
Fig. 7.2
Prompt for username and password


Connect to 192.168.0.150
The server 192.168.0.150 at B&K-Analyzer requires a username and password.
Warning: This server is requesting that your username and password be sent in an insecure manner (basic authentication without a secure connection).
User name:
Password:
Remember my password
OK
Cancel

The View Instrument Web Page

Fig. 7.3 shows the View Instrument web page, where you have an on-line display of the instrument. You can use the on-line display for monitoring the measurement only, you cannot change the display, or setup parameters, or start and stop measurements, etc.

Fig. 7.3
On-line display – for monitoring only



The instrument can be viewed by several people at the same time, however, the instrument response time will increase with the number of connected browsers.

The View and Control Instrument Web Page

Fig. 7.4 shows the View and Control Instrument web page, where you have an on-line display and keyboard for full control of the instrument. The on-line display can be used for monitoring the measurement.

The keyboard on the screen has the same functions as the instrument's keyboard. Click on the display with the cursor to control the instrument as you do when tapping on the screen of the instrument.

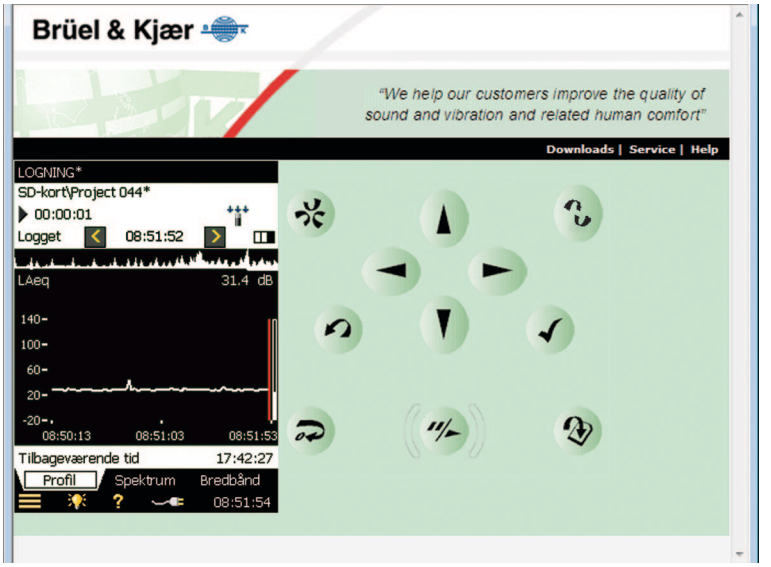


Fig. 7.4
On-line display and keyboard for full control of the instrument

Chapter 8

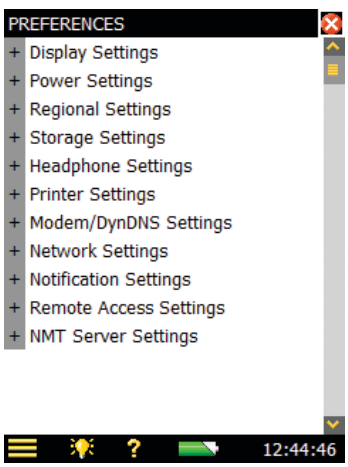
Advanced Use of Your Analyzer – Tips and Tricks

8.1 Setting Your Preferences on the Analyzer

You can specify a number of parameters controlling display settings, power settings, regional settings and storage settings. These parameters are grouped together under Preferences.

You access preferences by tapping on the **Main Menu** icon and selecting *Preferences* from the list of options. The screen shown in Fig. 8.1 will appear.

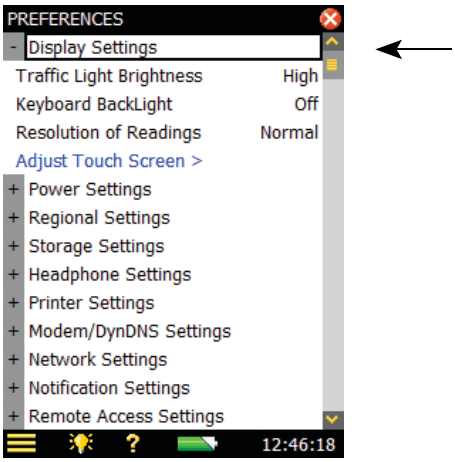
Fig. 8.1
The Preferences screen



8.1.1 Display Settings

Tap on *Display Settings*, or select the **Plus** icon + next to *Display Settings*, to expand the list of available display settings, see Fig. 8.2.

Fig. 8.2
Display Settings screen



You can select the optimum choice of brightness for the traffic light (for example, *High* in bright light conditions and *Low* in dark conditions) and you can select whether to have backlight on the keyboard, or not. In very bright lighting conditions you will not be able to see the backlight, so set it to *Off* to save some power.

A link is also provided in *Display Settings* to adjust the touch-sensitive screen. Tap on *Adjust Touch Screen >* to display a full screen with guidance on how to tap on a cross five times at different places on the screen. At the end of the adjustment procedure you can save the values or cancel the adjustment.

To change the number of decimal places on your dB results readout between 1 and 2 decimal places, or to change the number of digits on your engineering units readout between 3 to 4 digits, tap *Resolution of Readings* and set to *Normal* or *Extended*, as required.

When you have made your choices, tap on *Display Settings*, or on the **Minus** icon -, to collapse the list.

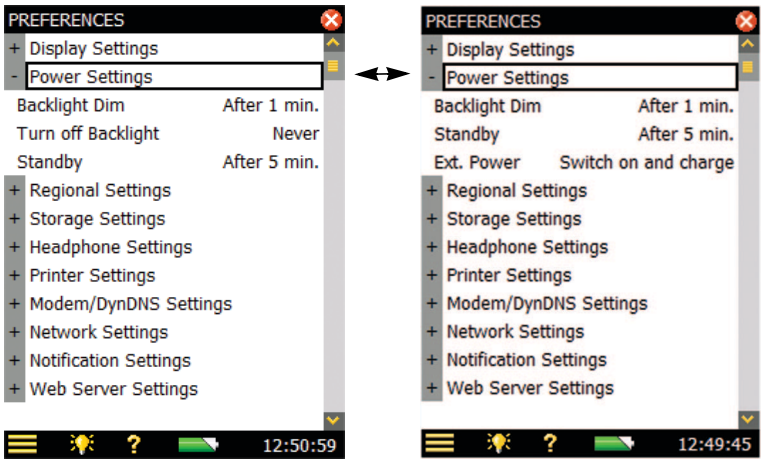
8.1.2 Power Settings

The analyzer has an advanced power management function, that takes care of supplying the different circuits with adequate power and switches off those circuits that are not in use. These power management functions can be changed via the *Power Settings* screen, see Fig. 8.3.

Tap on *Power Settings*, or select the **Plus** icon + next to *Power Settings*, to expand the list of available power settings:

- *Backlight Dim*
- *Standby*
- *Turn off Backlight* (only with hardware versions 1 – 3)
- *Ext. Power* (only with hardware version 4 (G4))

Fig. 8.3
Power Settings screen
Left:
Hardware versions 1 – 3
Right:
Hardware version 4

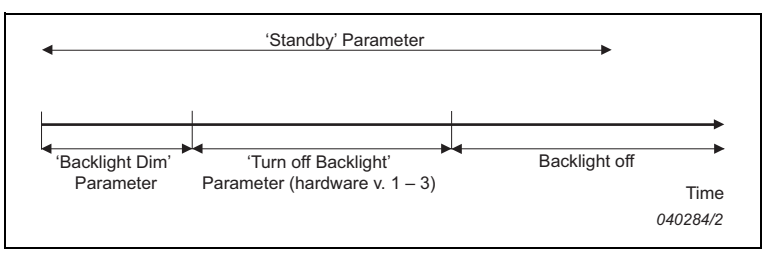


The backlight will be switched on as soon as you operate the instrument, either by using the keyboard or the stylus on the touch-sensitive screen. The backlight brightness will be one of the 6 levels set by tapping on the backlight icon at the bottom of the screen. Select the *Minimum* level for minimum brightness (and power consumption), and *Maximum* level for maximum brightness (and power consumption). Once you have chosen the level, select *Close* to save the settings.

When the analyzer has been left unused for the time specified in the *Backlight Dim* parameter, the backlight level will change to the dim level (*Minimum*).

- For hardware versions 1 – 3, this state will hold for the time specified in the *Turn off Backlight* parameter (if still left unused). If the analyzer has been left unused for the time specified in the *Backlight Dim* parameter plus the *Turn off Backlight* time period, then the backlight will be switched off completely (Fig. 8.4). Use the keyboard or tap the screen to switch the backlight on again
- For hardware version 4, the backlight will never be switched off completely because the *Minimum* dim level already has the lowest power consumption

Fig. 8.4
Power Settings overview



If the instrument is left unused, not measuring and not communicating over the USB interface, it will go to standby after the time specified in the *Standby* parameter. If the instrument is in standby mode, you have to press the power-on pushbutton to switch it on again.

The instrument will automatically switch off when it has been in standby mode without external power for more than 30 hours.

Note 1: If the instrument is powered externally the *Standby After* parameters are ignored and the instrument will never go to standby. However, if the instrument is left unused for more than *Standby After* time the *Standby After* setting will overrule the Backlight settings and the backlight will be switched off.

Note 2: Please use the *Display Settings* in conjunction with the *Power Settings* to save power during measurements and extend the battery operating time.

Hardware version 4 (G4) has an *Ext. Power* setting, which determines whether the analyzer automatically switches on and charges the battery when external power is applied or the battery is just charged. For unattended externally powered measurements (when not using timers), it is recommended to select the *Switch On and Charge* to ensure measurement will restart in case of temporary power failure.

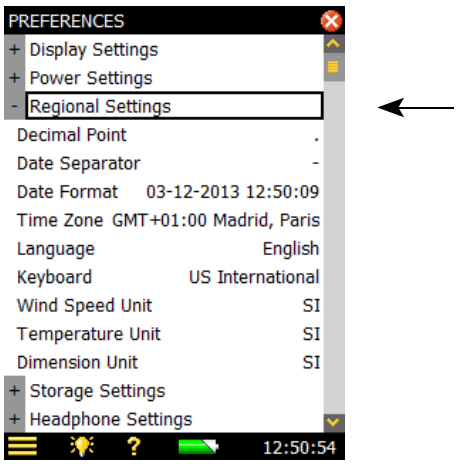
Hardware versions 1 – 3 have a similar function, but it is a small, manual switch at the back of the analyzer, behind the battery pack, which you must set. Remove the battery to access the switch.

When you have made your choices, tap on *Power Settings*, or on the minus icon -, to collapse the list.

8.1.3 Regional Settings

Tap on *Regional Settings*, or select the plus icon + next to *Regional Settings*, to expand the list of available regional settings, see Fig. 8.5.

Fig. 8.5
Regional Settings screen



Select your preferred settings for *Decimal Point* and *Date Separator* and select your preferred date/time format from the six different formats provided in the drop-down. Then select your time zone from the list.

A selection of common languages have been provided with the user interface of the analyzer. Select the one you prefer to change it immediately.

Built-in help is provided in the more commonly used languages – if your particular language is not covered, English will be chosen automatically.

Select a keyboard matching the one you prefer when using your PC.

Select the unit system for *Wind Speed*, *Temperature* and *Dimensions* as required:

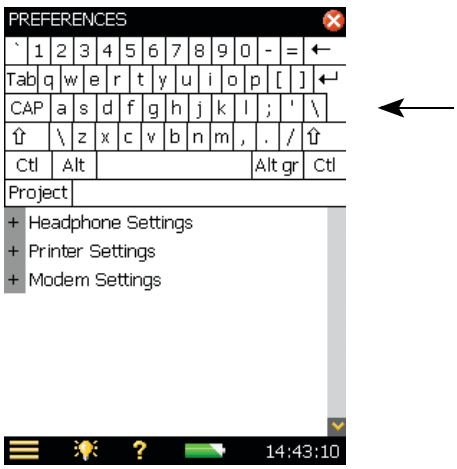
- Use the *SI* setting for measurement units in accordance with the SI standard, for example, measuring Wind Speed in m/s
- Use the *US/UK* setting for imperial measurement units, for example, measuring Wind Speed in mph

When you have made your choices, tap on *Regional Settings*, or on the minus icon -, to collapse the list.

8.1.4 Storage Settings

Each time you save the results of a measurement, the analyzer suggests a project name and number for the project. The Project Name Prefix can be generated automatically (from the start date of the project as Year, Month, Date in the format YYMMDD, for example, 051112 as 2005, November 12th) or you can specify a *Project Name Prefix* (max. 8 characters), using the standard full character keyboard that pops up when you tap on the current name set as the project name prefix, see Fig. 8.6. (The field where you type in the project name prefix will appear at the top or bottom of the pop-up keyboard, depending on how many settings you have expanded in the list.) The project suffix number will be generated automatically.

Fig. 8.6
Storage Settings screen



8.1.5 Headphone Settings

The headphone settings allow you to control the output to the headphone socket on the connector panel.

You can listen to the measured signal for monitoring purposes. Select between A/B-weighted, C-weighted or Z-weighted. (A/B-weighting is determined by setting the parameter in *Setup > Frequency Settings > Broadband (excl. Peak)*).

The measured signal covers approximately 120 dB (from approximately 20 dB to 140 dB with a Type 4950 microphone of nominal sensitivity). The output of the headphone socket covers approximately 75 dB. Use the gain settings for the measured signal to adjust the output level to suit the listening conditions. If the signal has a very high dynamic range (or the levels are unknown), you can set *Automatic Gain Control* to *On* – this will convert the 120 dB input range to 40 dB output range enabling you to hear signals of any level clearly.

Gain settings are provided for the measured signal. Tap on the gain parameter and use the keypad to enter a new setting. Use '@' to assign the new value for immediate response at the output – or use the up/down navigation keys to increment/decrement the value.

Note 1: A 0 dB gain on the measurement signal means you get a 1 V output for a 1 V input (when the measured signal *Automatic Gain Control* is set to *Off*).

Note 2: In hardware version 4 while playing back an annotation, you can use the Up/Down navigation keys to increase/decrease the gain of the annotation.

Note 3: If you do not want to listen to the input signal, then set the *Listen to Signal* parameter to *No*, to economise on power.

8.1.6 Printer Settings

You can make screen dumps on a printer connected to the analyzer using a standard USB cable, or on hardware versions 1 – 3, the supplied Adaptor AO-0657. Use the *Printer Settings* to select your preferred printer.

When a printer has been selected under the *Printer Used* parameter, then the **Print Screen** command in the Main Menu list appears. Use this command to print a screen dump of any screen on the analyzer.

The printer must either be a mobile thermal printer (from AM Tech or Seiko) or accept the PCL® printer language.

- *MPS*: Mobile Pro Spectrum – a mobile thermal printer from AM Tech (www.amteq.co.kr)
- *PCL*: printers accepting PCL printer language
- *PCL Inkjet*: suitable for Inkjet printers and supports colour printing
- *PCL Laser*: suitable for laser printers
- *Seiko DPU*: DPU-S245 or DPU-S445 – mobile thermal printers from Seiko Instruments (www.seikoinstruments.com)

PCL is the Printer Control Language developed by Hewlett-Packard (see www.hp.com). For PCL printers, you can use the *Top* and *Left Margin* parameters to position the print on the paper, and use *Width* and *Height* parameters to set the size of the print.

8.2 Modem/DynDNS Settings

You can use the analyzer for monitoring in remote places and control it using Measurement Partner Suite BZ-5503, via a telephone connection – wired or wireless – using suitable modems or via network connections. See the overview of possibilities in Table 7.1, in Chapter 7. When you connect via a modem, or via a network connection, you will see the contents of the analyzer in the Instrument Task as if you had made the connection via USB. You then have the same possibilities for transferring data to the Archive and organising data on the analyzer, as if you were connected via the USB connector.

Modems can be used for connection in the following way:

The analyzer is connected directly to the Internet through a modem. BZ-5503 or an Internet browser will then be able to connect to the analyzer through TCP/IP using the analyzer's (global) IP address. The setup of the modem connected to the analyzer is described in section 8.2.2 – please refer to the BZ-5503 on-line help for details on how to make a connection.

8.2.1 Connection to the Network using a LAN Modem

Using a 3G modem with LAN interface is a simple and very reliable and powerful way of remotely connecting to the analyzer.

Set up the modem according to its user manual (usually requires connection to a PC) before you connect the modem to your analyzer. When ready, connect the modem to the analyzer using a LAN cable. For hardware versions 1 – 3, you will also need the 10/100 Ethernet CF Card UL-1016 (see "Ordering Information" on page 136.).

The *Modem* parameter should be set to Off.

The following modem has been tested:

- Airlink Raven XE, Intelligent 3G Ethernet Gateway from Sierra Wireless (www.sierrawireless.com)

Note: The SIM card account should include a data subscription and should be usable without a pincode.

8.2.2 Connection to the Network using a GPRS/EDGE/HSPA Modem

Note: The SIM card account should include a data subscription and should be usable without a pin-code.

To use the modem you need to set up the parameters in *Dialup Networking* (listed below) and set the *Modem* parameter to *GPRS/EDGE/HSPA Dialup*.

Parameters in Dialup Networking:

- *APN* (Access Point Name) is an identifier required by the Network Operator. Examples are internet, public and www.vodaphone.de
- *Username*, *Password* and possibly *Domain* should be set as required by the Network Operator.

When the *Modem* parameter is set to *GPRS/EDGE/HSPA Dialup*, then a connection is made using the settings in *Dialup Networking*. The *Status* parameter reflects the current status of the network connection – e.g., 'Connected' or 'Disconnected'. If the connection fails, then the analyzer will try to reconnect – until it succeeds, or the *Modem* parameter is set to *Disabled*.

If the connection succeeds, then the instrument will automatically get an IP address, which is readable (but not accessible) in *Network Settings* – for more details see section 8.3.

The IP address is the address on the WAN (Wide Area Network) or Internet. Use this address in BZ-5503 or an Internet browser to connect to the analyzer.

Note: In some cases you might be able to get a static IP address from the Network Operator, which means that the analyzer will always get the same IP address, when connected to the network. However, typically the IP address will be renewed each time the analyzer connects to the network. In order to deal with this in BZ-5503 or an Internet browser you need to use DynDNS – see section 8.2.3.

Modems with USB Interface

Note: Turn off the analyzer when connecting the analyzer to a modem.

The following modems have been tested:

- Airlink Fastrack Xtend GPRS, EDGE and HSPA from Sierra Wireless (www.sierrawireless.com)

Modems with an USB interface can be connected to the USB Type A socket on hardware version 4.

Modems with RS−232 Serial Interfaces

The following modems have been tested:

- FASTRACK Supreme 10 and 20 GSM/GPRS/EDGE Modem from Wavecom
- Airlink Fastrack Xtend GPRS, EDGE and HSPA from Sierra Wireless (www.sierrawireless.com)

For hardware version 4, modems with an RS−232 serial interface can be connected using a USB to serial converter inserted in the USB Type A socket of the analyzer. The following USB to serial converters have been tested:

- USB to RS−232 Converter UL-0250 (see "Ordering Information" on page 136.)
- ES-U-1001-R10, ES-U-1001-B10 and ES-U-1001-A from EasySync (www.easysync-ltd.com)
- USB to RS232 Standard, USB to RS232 Professional and USB to RS232 Mini STD from U.S. Converters (www.usconverters.com)

For hardware versions 1 – 3, use a compact flash to serial converter inserted in the compact flash slot of the analyzer. The following compact flash-to-serial converter has been tested:

- Serial I/O CF Card – Ruggedized from Socket (www.socketmobile.com)

Compact Flash Modems

The following modem has been tested:

- Compact GPRS from Pretec (www.pretec.com)

Compact flash modems can be inserted directly in the compact flash socket of the analyzer.

8.2.3 DynDNS

If the analyzer is connected to:

- The Internet through a GPRS/EDGE/HSPA modem, or
- A local network with access to the Internet through a DSL modem/router

And you want to connect to the instrument from a place outside the local network, then you need to know:

- Global IP address of the instrument or
- The global IP address of the DSL modem/router (and ensure that correct port forwarding in has been set the router – see details in the on-line help for BZ-5503)

In some cases the global IP address is static and will never change, so you connect to the instrument using BZ-5503 or an Internet browser by using this IP address.

Normally when you browse to addresses using an Internet Browser you do not use the IP address itself, but a hostname for it (e.g. you would use the hostname www.google.com instead of '74.125.77.99'). This requires a DNS (Domain Name System) provider, which is a kind of Internet phone book that translates hostnames to IP addresses for you.

However, for a GPRS/EDGE/HSPA or even a DSL router then often the global IP address is renewed at each new connection or at certain time-intervals (e.g., every two weeks). In this case you will have to change the IP address in BZ-5503 or the Internet Browser accordingly. To avoid this, a service like DDNS (Dynamic Domain Name System) can be used.

DDNS is a network service that provides the capability for a modem/router/computer system to notify a domain name system provider to change, in real time (ad-hoc), the active DNS configuration of its configured hostnames and IP addresses. This will ensure that the hostname you use will always be updated to reflect the correct IP-address.

The analyzer supports DDNS provided by the world-wide DDNS service provider 'DynDNS.com'.

The analyzer can then be configured to notify DynDNS.com each time the global IP address is set or changed. When BZ-5503 or an Internet Browser connects to the analyzer it then uses a hostname defined by DynDNS.com. From DynDNS.com it then gets the updated IP address.

You need to make an account at DynDNS.com, specifying a user name and a password for the account and a hostname (e.g., 'MyBK2250.dyndns.org') identifying the analyzer.

In the analyzer you need to specify the Hostname, Username and Password and set *Active* to *Yes* in *Preferences*, under *Modem/DynDNS* settings. Each time the analyzer detects a change in the IP address it notifies DynDNS.com.

Note: To avoid too much traffic at DynDNS.com, the analyzer ensures that this service doesn't allow updates of settings more frequently than every 10 minutes. So you may experience up to a 10 minute wait for DynDNS settings to update.

8.3 Network Settings

The analyzer can be connected to a LAN (Local Area Network) through an Ethernet interface or to WLAN (Wireless Local Area Network) using equipment conforming to the IEEE 802.11a/b/g standard. This connection can be used to synchronise measurement and setup data with a host PC using BZ-5503.

The analyzer supports TCP/IP (Transmission Control Protocol/Internet Protocol) on the LAN and WLAN.

This requires the analyzer to have a unique address on the network. This address is called an IP address and consists of four sets of 3-digit numbers, e.g. 010.116.121.016.

The IP address can be obtained in different ways:

- Automatically
- Using DHCP

  A DHCP (Dynamic Host Configuration Protocol) Server on the network assigns automatically an IP address to the analyzer when connected to the network. This is the most common way of setting up IP addresses.
- Using Link-local

  If no address is automatically assigned by the DHCP Server, then after a few seconds the analyzer will use an address from the Link-local address range 169.254.x.x.

  This will most likely be the case when connecting the analyzer directly to a PC using an Ethernet Crossover cable
- Manually

  You setup the IP address manually.

  This will typically be the case in a private network without a DHCP Server.

8.3.1 Connecting to the Analyzer

Wired LAN Connection

- Use a “straight-through” (standard) Ethernet cable with RJ45 connectors at both ends to connect the analyzer to the network (via a hub, switch or router).
- Use a “crossover” Ethernet cable with RJ45 connectors at both ends to connect the analyzer directly to a PC.

Hardware version 4 has an Auto-MDIX facility, allowing you to use either a straight-through or crossover cable to connect to a network or PC.

WLAN Connection

The analyzer provides a wireless LAN option using a WLAN card.

Hardware version 4 accepts the following SD WLAN card:

- P322 802.11abg SD WLAN from Socket Mobile (www.socketmobile.com) – Brüel & Kjær order number UL-1025

Hardware versions 1 – 3 accept the following CF LAN and WLAN cards:

- 10/100 Ethernet Ruggedized CF Card from Socket Mobile (www.socketmobile.com) – Brüel & Kjær order number UL-1016
- Go Wi-Fi!® P500 CF WLAN, rev. B and rev. C from Socket Mobile – Brüel & Kjær order number UL-1019

8.3.2 Parameters in Network Settings

Location

Use the *Location* parameter to specify a text up to 20 character long identifying the analyzer or location of the analyzer. The Location will be displayed on the PC as well as the serial number of the analyzer when browsing for analyzers in BZ-5503 and when connected using the on-line display.

Note: The location parameter is useful for both USB and LAN connections.

Network Connection

- Hardware versions 1 – 3:
  - *None*: (default)
  - *CF Socket*: Select this to use an Ethernet CF Card inserted in the Compact Flash socket
  - *LAN Socket*: (default) Select this to connect via a LAN cable. This is disabled if an Ethernet CF card is inserted in the Compact Flash socket
- Hardware version 4 (G4):

  For all analyzer types, the default is *LAN Socket*.

Set IP Address

Automatically: This will obtain an IP address from a DHCP server – if no server available, then a Link-local address will be set

Manually: You have to set the *IP Address*, *Subnet Mask*, *Default Gateway*, *Preferred DNS* and *Alternate DNS* (see below)

IP Address

The IP address of the instrument

Selectable if Set IP Address = Manually

Subnet Mask

The Subnet Mask combined with the IP address identifies the network segment the analyzer is on

Selectable if Set IP Address = Manually

Default Gateway

Address to a gateway for routing to another network

Selectable if Set IP Address = Manually

Preferred DNS

The IP address of the primary DNS server

Alternate DNS

The IP address of the secondary DNS server

MAC Address

The MAC Address of the network adaptor (LAN or WLAN) in use. MAC (Media Access Control) Address is a unique identifier assigned to the network adaptor. This field is for information only

Status

The status of the network connection, either Operational or Non-operational:

- Operational: the network adaptor can be used for a connection
- Non-Operational: the network adaptor cannot be used

Parameters for Wireless LAN Only

Name

Name (SSID) of the network you want to connect to. Update the name either by:

- entering a name directly, or
- tapping on the Available Networks and selecting a name from the list

Available Networks

Tap on the line to get a list of available networks. Tap on a name in the list to connect to this network. The name is inserted in the *Name* line above this line. Each network name is preceded with Signal Strength information, ranging from Excellent (displayed as '• • • • •') down to No Signal (displayed as no dots at all)

Security

Select the security as required by the network: *Open*, *Shared*, *WPA PSK* or *WPA2 PSK*. Open and Shared are for WEP (Wired Equivalent Privacy) Infrastructure mode. WPA PSK is for WPA (Wi-Fi Protected Access) with Pre-shared Key (also called Personal mode). WPA2 is an enhanced version of WPA

Encryption

Select the encryption as required by the network: *None*, *WEP Enabled*, *AES Enabled* or *TKIP Enabled*. None is for Open security. WEP Enabled is for Open and Shared security. AES and TKIP Enabled are for WPA PSK and WPA2 PSK security

Encryption Key

Insert the encryption key required by the network. The key will be displayed until you press **Enter**, then it will be replaced by ' *** '

8.4 Notifications

The analyzer can send you a daily status or notify you if disk space is getting low or external power has disappeared, etc. This is done via SMS or e-mail, as described in this section. The SMS/e-mail notification contains a short status report for the analyzer. This facility is especially useful if the analyzer is left for unattended monitoring.

8.4.1 Alarm Settings

If one or more of the following alarms occur, then a notification will be issued as either an SMS or an e-mail, depending on your equipment and settings. If the notification fails (e.g. the connection has been lost), then the analyzer will retry to send the notification once more after 5 minutes.

Table 8.1 *Alarm Settings*

Alarm Type	Condition	Comment
Power On	When analyzer is switched on or reboots	Indicates start from a timer, or a power failure, or unexpected behaviour
Measurement State	When a measurement starts or stops	Indicates measurement finished – or unexpected behaviour
CIC	When Charge Injection Calibration fails	Indicates possible measurement problem
Internal Battery	When Internal Battery is entering a specified state: High, Low or Critical.	Indicates internal battery getting low. Internal Battery will be in one of the states: Full, High, Low, Critical, Charging or Unknown. You can set alarm to *High, Low* or *Critical* in *Preferences, Notification Settings, Alarm Settings, Internal Battery.* **Note:** The internal battery will typically be in one of the states *Full* or *Charging* if externally powered. Entering one of the set states might then indicate a power failure
Disk Space	When remaining disk space drops to or below a specified percentage of the total disk space	Indicates disk space getting low – needs to be swapped with an empty disk. Set the percentage in *Preferences*, *Notification Settings*, *Alarm Settings*, *Disk Space*

Table 8.2 *Content of Notification*

Information Type	Content
Reason for notification	'*Test*', '*Alarm*' or '*Status*' followed by a short description
Time of notification	*Date* and *Time*
Instrument ID	*Serial No*. and *Location*
Status of current Disk	*Free memory* / *Total memory*
Status of Internal Battery	*Full*, *High*, *Low*, *Critical*, *Charging* or *Unknown*
Measurement Status (if available)	*Running*, *Paused* or *Stopped*
Latest CIC Result (if available)	*Passed*, *Background noise too high*, *Ratio outside tolerances*, *Ratio deviates from Ref.*, *Undefined Ref.*, or *Undefined*
Current value of LAF (if available)	The value

Note: some of the information listed above may not be available, depending on the conditions when the notification was sent, e.g., no measurement values will be available immediately after a power on.

8.4.2 Text/SMS Notifications

Notifications via SMS (text message) can be used if you have connected a GSM/GPRS/EDGE/HSPA modem to the analyzer (see section 8.2.2) and set *Modem* to *Disabled* (a text message cannot be sent if the modem is set to *GPRS/EDGE/HSPA Dialup*).

In addition to sending SMS notifications initiated by alarms, you can send an 'INFO' SMS to the analyzer and ask for an SMS notification, after which you will get a notification within 30 seconds.

You need to setup a *Phone Number* in *Preferences*, *Notifications*, *SMS* and set *Active* to *Yes* for the SMS. You can also add a Name for the number for easier identification.

You can setup two individual SMS phone numbers for sending the SMS notification to two recipients.

Set *Notification* to *SMS* and a notification will be sent by SMS to the active phone numbers, when any of the alarm conditions are met, or if the analyzer receives an 'INFO' SMS.

You can test the system by tapping on the Main Menu icon and selecting "*Send Notification via SMS*".

Note 1: Two to three text messages will be used to send the complete notification – depending on the content and language settings.

Note 2: Text messages cannot be sent or received while the analyzer is connected to BZ-5503 or online display.

8.4.3 Email Notifications

Email notifications can be used if the analyzer is connected to a network with access to a mail server. This can typically be done if the analyzer is connected through LAN or by a GPRS/EDGE/HSPA serial modem (see section 8.2.2 and section 8.3).

Go to *Preferences* > *Notifications* > *E-mail* and setup details for the email account under the *To* parameter. The details consist of the SMTP server name, the SMTP port used, whether SSL/TLS is required or not, the Account, the Username and Password for the account – please consult section D.9 and your email provider for more details.

Set *Notification* to *E-mail* and a notification will be sent by email when any of the alarm conditions are met.

To test the system by tapping and select *Send Notification via E-mail.*

Example of email:

Subject: E-mail from 2479719 Abbey Road Test: Manual e-mail

Test: Manual e-mail

29-04-2009 12:51:16

Instrument 2479719 Abbey Road

SD-Card 383 MB / 483 MB

Internal Battery Charging

Measurement Status Running

CIC Result Passed

LAF 45.8dB

8.5 Web Server

To connect to the instrument using an Internet Browser, the following conditions must be fulfilled:

- The instrument must be connected to a network as described in section 8.2.2, section 8.2.3 and section 8.3
- The Internet Browser must support Java scripts

The web page of the instrument has been tested on the following Internet Browsers:

- Microsoft® Internet Explorer®, from version 7
- Mozilla® Firefox®, from version 3
- Google Chrome™, from version 2
- Apple® Safari®, from version 4

You may also be able to connect to the instrument using Internet browsers on smart phones such as an iPhone®.

Password Protection

Connection to the instrument is password protected. There are two levels of protection:

- Guest – for viewing only
- Administrator – for viewing and controlling the instrument

Username and Password

Under *Preferences* you set the *Username* and *Password* individually for the *Guest* and for *Administrator* accounts.

You need to specify *Username* and *Password* for the administrator, however, you can specify whether the guest requires a login or not.

8.6 Connecting to Weather Stations and GPS Receivers

8.6.1 Weather Stations

The analyzer can be connected to the following weather stations:

- Weather Station MM-0316 – for measurement of wind speed and wind direction
- Weather Station MM-0256 – for measurement of wind speed, wind direction, ambient temperature, ambient pressure, relative humidity and liquid precipitation

Please refer to the user manual for Noise Monitoring Terminal Type 3639-A, B and C (BE 1818) for details on how to mount and connect the weather station using Utility Unit ZH-0689.

When you have connected the Weather Station, you can verify the connection by displaying the instantaneous updated parameters *Wind Dir.* and *Wind Speed* from the *Weather* group.

Data from the weather station is automatically obtained during the measurement and saved on data – see measurement parameters in Appendix B. The measured data can be displayed as parameters from the *Weather* group.

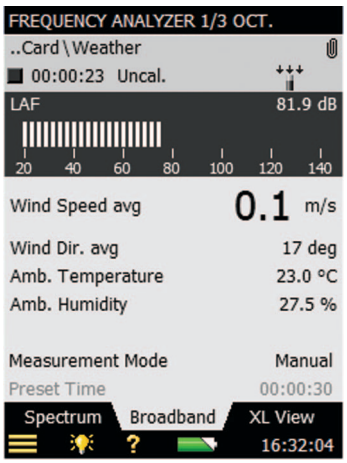


Fig. 8.7
Data from weather station obtained during a measurement and saved on data

8.6.2 GPS Receivers

The analyzer can be connected to the following GPS receivers:

- GPS Receiver ZZ-0249 – for measurement of latitude, longitude, altitude and position error

  Please refer to the user manual for Noise Monitoring Terminal Type 3639-A, B and C (BE 1818) for details on how to mount and connect the GPS receiver using Utility Unit ZH-0689.
- ND-100S GPS USB Dongle from Globalsat (www.globalsat.com.tw) – for measurement of latitude, longitude and altitude
- BU-353 Cable GPS with USB Interface from Globalsat – for measurement of latitude, longitude and altitude

The GPS receivers with USB interface can be connected directly to the USB port on analyzers with hardware version 4. On hardware versions 1 – 3, the GPS receivers can be connected using USB Adaptor AO-0657.

The first time you connect the GPS receiver to the analyzer (or if it has been several days since you last connected them), be sure to be in an open area with a clear view to the sky (such as a park or empty field). Wait for GPS initialization to complete. This may take a few minutes depending on factors such as the distance from the previous coordinates, GPS signal strength and surrounding terrain (tall trees and buildings can block the satellite signals).

Once the Latitude and Longitude (from the Special parameter group) display data, a fix has been initialized (the LED on the GlobalSat GPS will also start to flash).

In some cases initialization can take up to several minutes depending on the conditions mentioned above before complete GPS data are displayed on the screen. The GPS may get a faster fix if connected through a small USB cable (delivered together with the GPS).

If a GPS receiver is connected when data is saved in a project, a GPS note is automatically created as an annotation with the GPS information.

See more details on GPS notes in section 3.5.

8.7 Timers and Automatic Measurements

Automatic control of the analyzer is available via one or more of the analyzer's timers (up to ten).

The purpose of a timer is to initiate measurements in the absence of an operator. Basically, a timer will:

- Switch on the analyzer at a preset time
- Load a preselected template
- Start a measurement as specified in the template
- Stop the measurement after a preset time defined by the Timer Setup
- Save the measurement
- Switch the analyzer off
- Repeat the above a preset number of times at preset intervals

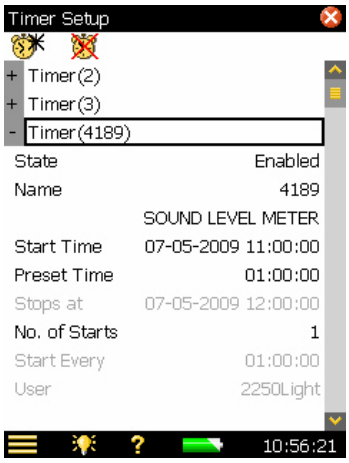
For a timer to work, the analyzer must be in the 'switched off' state.

A timer will never interrupt the analyzer if it is already in use manually. If a switch-on time is during the time the analyzer is in use, the timer opportunity is lost.

You can control the analyzer during a timer-initiated measurement as long as this does not affect the measurements. If you try to change any parameters affecting the measurement you will be warned of this. If you persist, the analyzer will revert to manual control and timer control cannot be resumed.

The Timer Setup lists the timers that have been defined previously on the analyzer (i.e., added by you or previous users).

Fig. 8.8
Example Timer Setup



In the topmost line you can add other timers by tapping on the Add New Timer icon . You can delete a timer from the list by tapping on the Delete Timer icon . Only timers created by the current user can be deleted – to delete a timer defined by another user, you have to logon as the other user and then delete the timer.

For each timer you can specify:

- *State:* Enable or disable the timer
- *Name:* Name the timer
- *Template:* Select the template you want to use for the measurement.
- *Start Time:* Set the start time – at least 3 minutes ahead of current time
- *Preset Time:* Set the preset time for the measurement – regardless of the settings in the template used by the timer
- *Stop Time:* The time when the measurement stops – for information only
- *No. of Starts:* Set to the total number of times you want to start the measurement
- *Start Every:* The time interval between the start of each successive measurement. This interval must be greater than *Preset Time* + 3 minutes
- *User:* The user who specified the timer. Cannot be changed

Note: When using timers for automatic measurements, ensure the meter is connected to a stable power supply. It is advised to select the Ext. Power setting ‘Charge battery only’ – see section 8.1.2 – to avoid interference with timer operation.

Chapter 9

Updating, Maintenance and Troubleshooting

9.1 How to Install New Applications

Sound Level Meter Software for 2250 Light BZ-7130, 1/1-octave Frequency Analysis Software for 2250 Light BZ-7131, 1/3-octave Frequency Analysis Software for 2250 Light BZ-7132, Logging Software for 2250 Light BZ-7133, Signal Recording Option BZ-7226 and Tone Assessment Option BZ-7231are pre-installed on the analyzer. However, a valid license is required to run the software. If you have purchased the analyzer together with the software application(s), then the relevant license(s) will come pre-installed on the analyzer.

If you purchase a separate software application for your analyzer, then you have to install the license on the instrument. This is done using Measurement Partner Suite BZ-5503, please consult the on-line help included with the BZ-5503 software for instructions on how to install a license.

Tap the **Help** icon ? on the analyzer's screen, then select *About* to get a list of installed software and licenses.

9.2 How to Update/Upgrade Applications and Install New Languages

Brüel & Kjær recommends that you always use the most current software available. New versions of the analyzer software are available for download via the Brüel & Kjær website (www.bksv.com), which you may want to install on your analyzer. To do this, use Measurement Partner Suite BZ-5503, or connect the analyzer directly to the Internet to download. Some software versions will be free updates, and some will be upgrades requiring that a new license is purchased.

9.2.1 Update/Upgrade using BZ-5503

BZ-5503 can be used for updating or upgrading new software applications on your analyzer. It can even downgrade to specific software versions if required by type approving authorities. Using BZ-5503, you can also install licenses for the specific applications; and, if you have

hardware version 1 – 3, install your preferred language (with G4 hardware, all languages are pre-installed in the analyzer). Installation requires a USB connection between BZ-5503 and the analyzer.

The BZ-5503 software will clearly indicate if the new software version is an update (free of charge) or an upgrade (license fee). Please consult the on-line help included with the BZ-5503 software for instructions on how to install upgrades/updates of the software, together with your preferred language.

Tap on the **Help** icon ? on the instrument's screen, then select *About* to get a list of installed software and licenses.

9.2.2 Update Through the Internet

The analyzer can update software by itself, if it is connected to the internet – see section 7.1.

This method is particularly useful if the analyzer is used for long term monitoring, and you do not want to go to the measurement site for servicing (that is, you want to disturb the measurement as little as possible).

Note: The method is used for updating the software with the latest version available from the Brüel & Kjær website. The languages already installed will be updated at the same time. If you have hardware versions 1 – 3, you cannot install new languages or licenses – to do this, you must use BZ-5503.

The update procedure is as follows:

1) Tap on the **Help** icon ? on the instrument's screen, then select *About* to get a list of installed software and licenses. Scroll down to the bottom of the screen and tap on the *Check for updates on the web...>* link, the Software Update screen appears – see Fig. 9.1and Fig. 9.2.

   Note: This can be done remotely if you connect to the on-line display using either BZ-5503 or an Internet Browser.

2) Click on the **Check for Updates** button to check for the latest updates. This will connect to the Brüel & Kjær update server – if a new software version is available the build version will be displayed and you can start the update (you will be warned, if the new version requires a new license) or decline the update. If the versions that are available are not later than those already installed you will be told so and the update will be terminated.

3) If you choose to update the analyzer, the software will start downloading to the SD or CF card (CF card only with hardware versions 1 – 3) already inserted in the analyzer. You need at least 200 MB of free space on the memory card. Depending on the speed and quality of the Internet connection, this can take from a few minutes to several hours. If the connection is lost, then the download will automatically continue when connection is established again.

   Note: The analyzer can continue measuring during the download period.

4) When download is complete, the measurement is paused and normal use of the instrument is prevented. Connections to the instrument are terminated and the upgrade of the instrument will start. This will take 10–15 minutes and the analyzer will reboot when finished. Any unsaved logging data will be saved and the analyzer is ready to use again.

5) Connect to the instrument again and verify the new software version by tapping on the **Help** icon ? on the instrument's screen, then select *About*.

To continue the measurement, press the **Start** pushbutton.

Note: If you have set up your instrument for e-mail notifications (see section 8.4), then you will get an e-mail in step 4), when the analyzer is paused, and you will get a new email in step 5), when the analyzer has rebooted and is ready for connection again.

Fig. 9.1
About screen - Showing the 'Check for updates on the Web' link

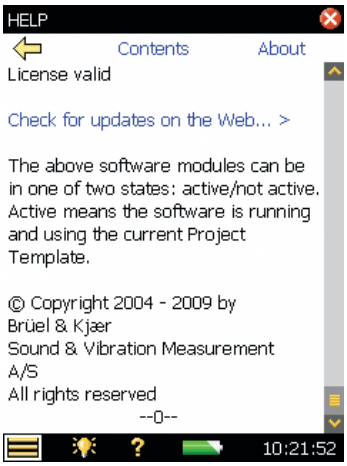
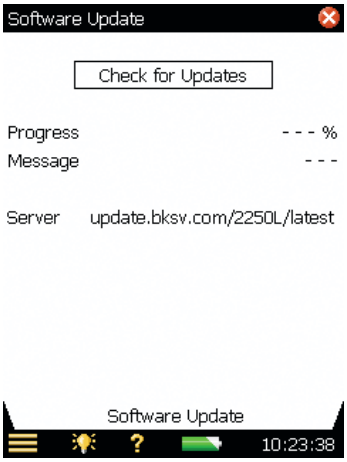

HELP
Contents
About
License valid
Check for updates on the Web... >
The above software modules can be in one of two states: active/not active. Active means the software is running and using the current Project Template.
© Copyright 2004 - 2009 by Brüel & Kjær Sound & Vibration Measurement A/S
All rights reserved
--0--
10:21:52

Fig. 9.2
Software update screen - Showing the 'Check for Updates' button



9.2.3 Downgrade to an Earlier Version

It is possible to downgrade to an earlier version of the software:

1) Within the server address (see Fig.9.2) change the text “latest” to the desired software package, e.g., “SW22.”
2) Press **Check for updates**.
3) Follow the procedure described in section 9.2.1 or section 9.2.2.

Note: Only the software package SW24 or newer can be downgraded to another package.

Software packages down to SW21 are available for update through the Internet.

9.3 Troubleshooting

9.3.1 Measurements

If your measurement seems to be wrong, then:

- Check the cabling, if any
- Check that the microphone, including preamplifier, is correctly mounted in the top socket (or correctly connected to the extension cable)
- Check that the transducer you have mounted on your analyzer is selected as the *Transducer Used* parameter, this is also found in the **Setup** menu
- Check whether the parameters for the selected transducer (*Transducer Used*) are set correctly, especially the *Microphone Type* parameter. This is found by tapping the **Main Menu** icon , then *Transducers*
- Check that the *Sound Field* and *Windscreen Correction* parameters have been set correctly. These are found by tapping the **Main Menu** icon , then *Setup* > *Input*
- Check if the calibration is OK (make a new calibration using an external calibrator)

9.3.2 SD/CF Cards and USB Sticks

The Logging and Signal Recording software requires that measurements are saved on memory cards – SD or (with hardware versions 1 – 3) CF. A USB memory stick can be used from hardware version 4.

Device Format and Speed

In order to ensure reliable operation with the memory device, the format of the file system and the speed of the device are tested. Upon insertion, the analyzer verifies the format of the memory device’s file system. If the file system is not optimal for usage with the analyzer, then you are prompted to format it. You will be guided through the process.

When the format of the file system has been accepted, then the speed of the device is tested. The test writes data to the device and measures the writing speed. The test takes less than a minute. If the speed test is successful, then you can proceed using the device, otherwise you should use another memory device or try reformatting the device (if not done already).

Problems with Storing or Recalling Data

If you experience problems in storing or recalling data on memory devices, you can check and repair the integrity of the file system on the device or even re-format it, by doing the following:

1) Insert the memory device in the correct slot of the connector panel of the analyzer.
2) You will be notified that a device has been inserted – select *Yes* to change the default measurement path to it.
3) Tap the **Main Menu** icon , then *Explorer*.
4) Tap on the icon to go up folder levels until you have reached the topmost level with a list of the available memory devices.
5) Tap on the name of the device (not the icon) to get a list of available commands.
6) Select *Check and Repair* to start the procedure. If any errors are found in the file system, they are fixed. When finished, you will be informed whether the device was OK or that errors have been fixed.

   Note: The checking procedure can take several minutes, depending on the size of the memory device.

Formatting a memory device:

7) Select *Format* to start the formatting procedure.

WARNING: All data on the device will be erased during the formatting process.

WARNING: Do not remove the device or switch off the instrument during the procedure – this might damage the file system and data, and make it unusable.

Note: The read/write performance of memory cards and USB memory sticks varies a lot. The performance depends on the manufacturer of the device, the type of device, its size, how much it has been used, how fragmented the memory is, and even the day of production. Two 'identical' devices can have a different performance because the manufacturer has changed the internal technology without notice.

In general, as a rule of thumb, you should select memory devices aimed for the industrial or professional photographer market.

The cards delivered by Brüel & Kjær have all been tested for their read/write performance in an analyzer and can be used for the applications available in an analyzer. If you need more (or other) types of memory devices, please consult your local Brüel & Kjær representative.

Remember to regularly re-format the device (especially before a long unattended measurement) – this will ensure the best performance.

8) Select *Test Speed*, if you want to check the device's file speed.

9.3.3 Battery Pack and Recalibration of Battery Charge Indicator

The software keeps the capacity of the battery pack updated. Over time the total capacity of the battery pack decreases. If you find that the 'Time Remaining' estimate (tap on the battery icon to get this information) does not match the real time remaining (for example, the instrument switches off automatically because of lack of power while the Time Remaining estimate indicates at least ½ hour), then you should manually re-calibrate the capacity of the battery pack. This is done using the following method:

- Drain all the power from the battery:
  - Switch the instrument on
  - Disconnect external power
  - Disconnect the instrument from the PC
  - In the *Preferences* menu, under *Power Settings*, set *Standby After* to *Never*
  - You may want to set *Backlight On* to *Always* (in the same menu) and select the maximum level of display backlight in order to drain the battery faster (use the Backlight icon at the bottom of the screen)
  - Leave the instrument until the battery voltage becomes so low that the analyzer switches itself off
- Charge the battery fully (at least 10 hours):
  - Connect the Mains Power Supply ZG-0426 (or ZG-0429) to the analyzer
  - Switch the instrument on (and leave it on) and remember to reset the *Standby After* and *Backlight On* to your preferred settings

Tap the battery icon and a pop-up appears, giving details of the battery condition. This will indicate *Calibrating Battery* initially. Let the battery charge until the battery charge indicator just below the power socket starts flashing green (hardware versions 1–3) or changes from red to green (hardware version 4) and the *Calibrating Battery* indication has disappeared from the pop-up window.

9.3.4 Touch Screen

If tapping with the stylus on the screen seems to be getting more inaccurate, you can adjust the touch sensitive screen, as follows:

- In the *Preferences* menu, under *Display Settings* activate the link *Adjust Touch Screen*. This displays a full screen with guidance on how to tap on a cross five times at different places on the screen. The adjustment procedure ends with saving the values or cancelling the adjustment

9.3.5 Reset Options

Reset Button

⚠ **WARNING:** Unsaved data or setups will be lost when you reset the instrument.

If your analyzer stops responding to pushbutton presses, or stylus taps, you can:

- Reset and reboot the instrument by pressing the reset button (located on the connector panel – see in Chapter 2) with the point of the stylus

If you still experience problems, try resetting your analyzer as described below.

Instrument Reset

1) Reset the analyzer to a default/factory installed state.
   – For hardware versions 1 – 3, you will reset the analyzer to a default state, where the user is set to *2250 Light* and the project template is set to **Sound Level Meter**. The existing **Sound Level Meter** project template will be overwritten, as will the preferences for the user. To reset the analyzer to the default state:
     a) Press and hold the **Power-on** pushbutton for at least five seconds (powers off).
     b) Press and hold down the **Manual Event 2** and **Save** pushbuttons while switching on the analyzer. The display in Fig. 9.3 will be shown.

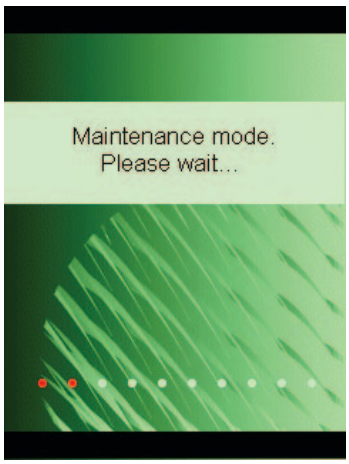
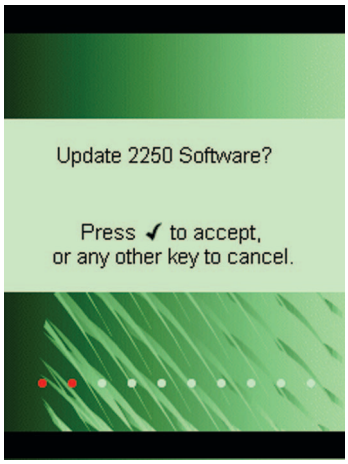


Fig. 9.3
Maintenance Mode –initial screen

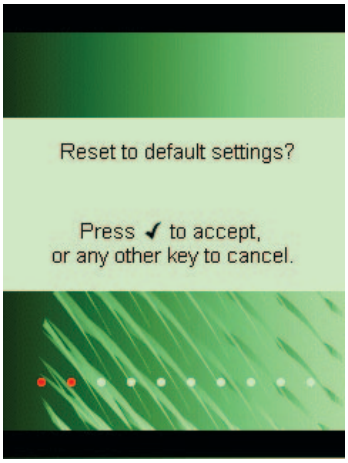
Within a few seconds the display in Fig. 9.4 will be shown.

Fig. 9.4
Update 2250 Light software screen



c) Cancel the update by pressing any other pushbutton than the **Accept** pushbutton ✓.

Fig. 9.5
Reset to default settings screen



d) Press the **Accept** pushbutton ✓ to reset to default settings.

– With hardware version 4 (G4), the analyzer contains two sets of the firmware/software package and settings. The one originally delivered with the analyzer and one installed afterwards. To restore the factory firmware/software package and settings:

a) Press and hold the **Power-on** pushbutton for at least five seconds (powers off).

b) Press and hold down the **Manual Event 2** and **Save** pushbuttons while switching on the analyzer. The display in Fig. 9.6 will be shown.

Fig. 9.6
Restore factory firmware and settings on hardware version 4

c) Press the **Accept** pushbutton ✓ to restore factory firmware and settings.

2) (all hardware versions) If the instrument now functions normally, define your preferred settings in the *Preferences* menu, adjust the touch screen again and make necessary changes to *Setup* (all accessed via the **Main Menu** icon).

If you experience problems selecting another template or you login as another user, then note which step causes the problem. You might need to delete/reconfigure the templates or users.

To delete/reconfigure templates or users, use Measurement Partner Suite BZ-5503 with the analyzer connected to the PC via Micro USB Cable AO-1494 (G4 hardware) or Mini USB Cable AO-1476, or a modem/LAN connection. Please consult the on-line help included with the BZ-5503 software for instructions on how to configure the analyzer.

Re-installing Software (Hardware Versions 1 – 3)

If the instrument still does not work normally after performing the 'Reset to Default Settings' procedure, then the software might need to be re-installed. This can be done in two ways:

1) If the connection to Measurement Partner Suite BZ-5503 works with the instrument connected to the PC using a USB cable, then the software can be re-installed and re-configured through the USB cable. Please consult the on-line help included with the BZ-5503 software for instructions on how to re-install software on the analyzer.

2) If the connection to the PC does not work, then you need a Compact Flash card (size at least 64 Mbytes) and a Compact Flash card reader for the PC. You can then use Measurement Partner Suite BZ-5503 to update the Compact Flash card with the necessary files. Please consult the on-line help included with the BZ-5503 software for instructions on how to update a Compact Flash card with installation files for the analyzer.

   Power off the analyzer and insert the compact flash card in the CF slot on the instrument. Then press and hold down the **Manual Event 2** and **Save** pushbuttons while switching on the instrument. The Maintenance Mode initial screen will be displayed, and then within a few seconds the screen shown in Fig. 9.4 will appear.

Press the **Accept** pushbutton ✓ to update the software. This will take approximately 5 minutes.

⚠ **WARNING:**Do not remove the CF-card while updating the software!

When the software has been updated, you will get the option of resetting to the default settings.

If the problem still persists, then you should contact your local Brüel & Kjær representative.

9.4 Services at Brüel & Kjær for Type 2250 Light

9.4.1 Accredited Calibration

For Type 2250 Light, you can order accredited calibration and choose between DANAK, A2LA, UKAS, Eichamt (Austria), RvA, ENAC, NATA and Inmetro.

For Spain, Primitiva is available.

The calibration will be performed in an ISO 17025 certified laboratory.

9.4.2 Initial Calibration

To start the measurement history from day one – if this is required, for example, for measurement use in public, for customer audit or quality procedures – we recommend you order accredited calibration together with the new instrument.

9.4.3 Regular Recalibration

To fulfil requirements for public measurements and to minimise the cost of errors due to faulty or inaccurate measurements, we can arrange for calibration every year in an ISO 17025 certified laboratory at Brüel & Kjær. With annual data, you will have an unbroken history to use as reference, either for internal requirements, for audit required by authorities or at the request of your customers. And not least, you can follow the history of sensitivity for your instruments over time.

9.4.4 Filter Calibration

- You can order calibration of filters. Please specify at the time of ordering.
- Calibration of filter response for octave and 1/3-octave filters according to IEC 61260.

9.4.5 Service and Repair

The hand-held analyzer is designed and constructed to provide many years of reliable operation. However, if a fault occurs that impairs the analyzer's correct function, then remove the battery pack and disconnect any external power supply to prevent risk of further damage.

For more information about preventing faults or damage to your sound level meter, see section 9.5.

9.4.6 Hardware Maintenance and Repair

You can minimise the risk of unexpected costs by purchasing the hardware maintenance with a five years warranty. Minor repairs, such as those resulting from damage caused by unauthorised use of the instrument, can be performed at the same time as the instrument is being calibrated at Brüel & Kjær. This will save you time. If any other errors are detected by the technician during calibration, repair will be performed before returning the instrument to you.

Repair is available at a fixed price, which includes a Conformance Test Certificate upon the return of your instrument (no measurement data included).

9.4.7 Rental

To ensure optimal uptime, you can rent a substitute Hand-held Analyzer* while yours is being calibrated. To arrange rental, please contact your local Brüel & Kjær representative.

9.4.8 Training

Basic knowledge on sound and vibration measurement, instrument training and application training are a few examples of what local training or consultancy hours[a] can do for you. To find out more about training and consultancy hours, please contact your local Brüel & Kjær representative.

9.5 Care, Cleaning and Storage

Your analyzer is a robust instrument, however, when handling, storing or cleaning your instrument, please take the following precautions.

9.5.1 Handling the Instrument

- Do not try to remove the microphone grid as you can easily damage the microphone
- Do not attempt to open the instrument. There are no user-serviceable parts inside. If you think your instrument requires service, please contact your Brüel & Kjær representative
- Do not allow the instrument to get wet
- Protect the instrument from impact. Do not drop it. Transport it in the supplied carrying pouch

9.5.2 Cleaning the Instrument

If the instrument casing becomes dirty, then wipe it with a lightly dampened cloth. Do not use abrasive cleansers or solvents. Do not allow moisture to enter the microphone, connectors or casing.

*. Providing this service is available from your local Brüel & Kjær office

9.5.3 Storing the Instrument

- Keep the sound level meter in a dry place, preferably within its carrying pouch
- For long-term storage, remove the battery pack
- Do not exceed storage temperature limits of –25 to +70°C (–13 to +158°F)

Chapter 10

1/1- and 1/3-octave Frequency Analysis (Optional Modules)

2250 Light has two optional Frequency Analysis modules, these are:

- 1/1-octave Frequency Analysis Software for 2250 Light BZ-7131 enables you to make 1/1-octave measurements and broadband sound level measurements simultaneously
- 1/3-octave Frequency Analysis Software for 2250 Light BZ-7132 enables you to make 1/3-octave measurements and broadband sound level measurements simultaneously

Check the About Menu to see whether you have the right license to run the frequency analyzer you require. The About Menu is accessed from the built-in help – tap ? on the shortcut bar, then select *About*. See Chapter 9 for instructions on installing the license for the frequency analyzer.

10.1 Setting up the Instrument

The frequency analyzer measures the following spectrum parameters during timed measurements:

- L_{Xeq}
- L_{XFmax}
- L_{XSmax}
- L_{XFmin}
- L_{XSmin}

where X is the frequency weighting A, B, C or Z.

These spectra are saved in the project together with the measured sound level meter (broadband) parameters.

In addition, the instantaneous spectra L_{XF} and L_{XS} are always available.

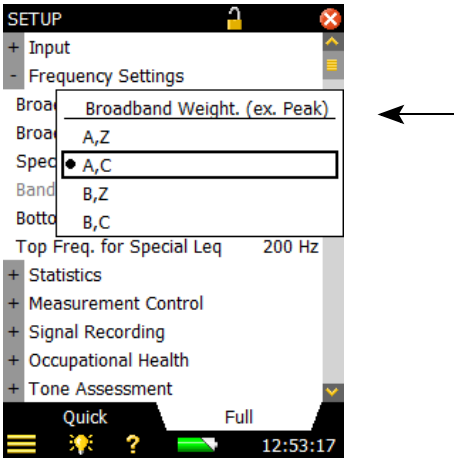
1) Select the **FREQUENCY ANALYZER 1/1-OCTAVE** or **FREQUENCY ANALYZER 1/3-OCTAVE** Project Template. (See section 3.3.1 for more details on templates.) The Project Template is displayed at the top of the screen, if it does not display **FREQUENCY**

ANALYZER 1/1-OCTAVE (or 1/3-OCTAVE), tap on the black bar at the top of the screen and select **FREQUENCY ANALYZER 1/1-OCTAVE** (or 1/3-OCTAVE) from the drop-down that appears.

2) Tap the **Main Menu** icon and select *Setup* from the list of options. Set the *Broadband* and *Spectrum* parameter to A, B, C or Z, as required. (A/B-weighting is determined by setting the parameter in *Setup* > *Frequency Settings* > *Broadband (excl. Peak)*).

   To exit the screen, tap .

Fig. 10.1
Setting the frequency weighting parameters



Under the *Signal Recording* parameters, choose the settings for recording the signal while making the measurement – see Chapter 12.

Under the *Tone Assessment* parameters, choose the settings for Tone Assessment – see Chapter 13.

10.2 Controlling the Measurement

The measurement is controlled in the same way you would control a normal sound level meter measurement, using **Start/Pause**, **Continue**, **Back-erase** and **Reset** pushbuttons, see Chapter 3 for more details.

10.3 Displaying the Results

The frequency analyzer measurement screen includes three tabs at the bottom: *Spectrum*, *Broadband* and *XL View* (Extra Large View). The tabs allow you to choose different ways of displaying the measurement results. All but the *Spectrum* tab have been covered previously in Chapter 3, however, a quick recap is provided below.

The *Broadband* view shows an instantaneous L_{AF} readout, with associated bar graph and four measurement parameters, followed by two measurement setup parameters. (The first measurement parameter is displayed in a larger font size for better readability.)

The *XL View* increases the size of the first parameter readout to a 4 digit, full-screen display (including decimal point).

The *Spectrum* view (which only appears as a tab if 1/1-octave or 1/3-octave Frequency Analysis Software for 2250 Light BZ-7131/32, is enabled), shows two different spectra being measured simultaneously. In the example in Fig. 10.2, L_{ZFmax} and L_{ZF} are being viewed at the same time.

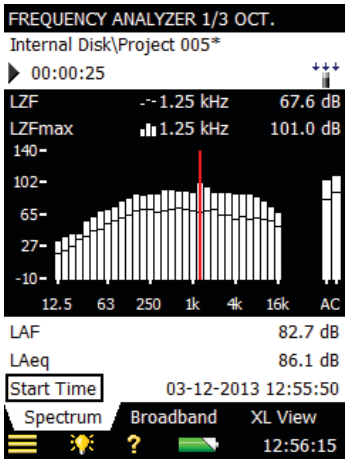
Note the -·- and icons, indicating which spectrum belongs to which parameter.

1) Select which spectra to view by tapping the parameter fields in the two lines above the spectrum display.

   These lines also include readouts of the spectrum values highlighted by the spectrum cursor. Tap on the spectrum at the frequency of interest – or just tap anywhere in the spectrum area and then move the cursor to the position of interest using the left ◄ and right ► arrow pushbuttons.

   To the right of the spectrum, two broadband bars (of the same parameters) are also displayed.

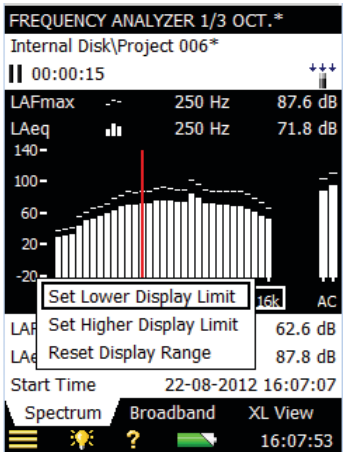
Fig. 10.2
Displaying the results – spectrum screen



2) Adjust the X-axis (the horizontal frequency axis below the graphical display) by tapping on the scale and accessing the drop-down menu, see Fig. 10.3.
   - use *Set Lower Display Limit* to set the lower frequency limit of the X-axis
   - use *Set Higher Display Limit* to set the upper frequency limit of the X-axis
   - use *Reset Display Range* to display all measured frequency bands

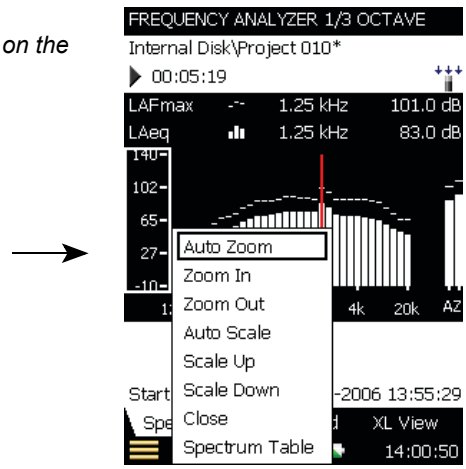
   Note: These settings only affect the frequency range of the display of measured data, not the frequency range of the measurement itself.

Fig. 10.3
Adjusting the X-axis



3) Scale the Y-axis (left-hand vertical scale of the graphical display) by tapping on the scale and accessing the drop-down menu, see Fig. 10.4. (You can also select the spectrum cursor and press the **Accept** ✓ pushbutton.)

Fig. 10.4
Scaling the Y-axis on the Spectrum display



Select *Auto Zoom* to adjust the range of the Y-axis for best fit of the measured spectrum.

Select *Zoom In*/*Zoom Out* to adjust the zoom.

Select *Scale Up/Scale Down* to adjust the full scale value on the Y-axis – or select *Auto Scale* to select the best scaling for viewing the spectra – without adjusting the zoom.

Auto Zoom and *Auto Scale* automatically close the drop-down menu, otherwise, select *Close,* tap outside the drop-down list or use the left arrow ◄ pushbutton to close the menu.

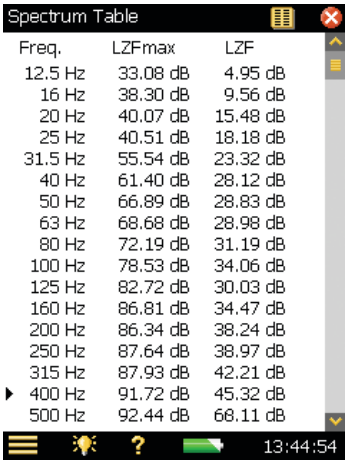
Hint: a quick way of auto zooming is to tap anywhere in the spectrum and then press the **Accept** ✓ pushbutton twice.

Spectrum Table shows the displayed part of the spectrum in tabular form – as in Fig. 10.5. Press the **Table Format** icon at the top of the screen to select between two different viewing formats:

– *Two Parameters*: for displaying values from both spectra

– *One Parameter (wrap)*: for displaying values from the main spectrum only, but with the columns wrapped on the display to allow as many values as possible on the screen

Fig. 10.5
Spectrum table



To exit the Spectrum Table, tap .

Note: Save the template, if you want to use the display settings for other measurements.

Some parameters are calculated based on the spectra:

- SIL, PSIL, SIL3 and L_{Xeq}(f1–f2) are calculated during the measurement and saved together with the other measurement data
- The Noise Parameters NC, NR, RC, NCB, Loudness and Loudness Level are for display only and calculated based on measured L_{Xeq} spectra. This means that whenever you have a L_{Xeq} spectrum you can also calculate and display these parameters
- NC, NR, RC and NCB are defined for 1/1-octave L_{Zeq} spectra, however, NC, NR, RC and NCB are calculated for any frequency weighting and any octave bandwidth. A-, B- and C-weighted spectra are converted to Z-weighted spectra and 1/3-octave spectra are converted to 1/1-octave spectra before the calculation
- Loudness and Loudness Level are calculated for 1/3-octave spectra with any frequency weighting. A-, B- and C-weighted spectra are converted to Z-weighted spectra before the calculation

If 1/1-octave L_{Zeq} spectra have been measured, then you can display a Noise Curve together with the L_{Zeq} spectrum, see example in Fig. 10.6.

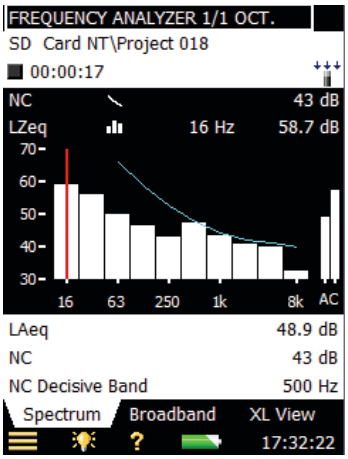


Fig. 10.6
Displaying a Noise Curve together with the L_{Zeq} spectrum

For RC and NCB you also have the possibility of displaying the limit curves for Rumble and Hiss, and for Rattle and Vibration together with the 1/1-octave L_{Zeq} spectrum.

10.3.1 Smileys

A smiley will be shown to the right of the project name if there are any issues with calculating Noise Parameters, or displaying noise curves, see the overview in Table 10.1.

Table 10.1 *Overview of Smileys*

Smiley	Explanation	Description
	No Loudness for 1/1-octaves	Select 1/3-octave
	No L_{eq} parameter logged	Select a L_{eq} spectrum for logging
	Sound Field Mismatch for Loudness	Set the *Loudness* parameter in *Input* in accordance with the *Sound Field Correction*
	Frequency bands outside Noise Curves	Levels are lower or higher than any noise curve band
	Noise Curves require use of Mic.	Select a microphone
	Display Noise Curve with L_{Zeq}	Noise parameters are calculated but Noise Curves can only be displayed together with L_{Zeq}
	Noise Curve for 1/1-octaves only	Noise parameters are calculated but Noise Curves can only be displayed for 1/1-octaves

10.4 Saving Results

Measurements are saved and can be viewed later, in the same way as described for the Sound Level Meter Project in Chapter 3.

Chapter 11

Logging (Optional Module)

Logging Software for 2250 Light BZ-7133 enables you to measure and save data periodically on SD or CF cards. You can also save to a USB memory stick with hardware version 4. The module is optimised for attended use, which means that while measuring you can 'mark' up to five different sound categories online.

The main benefit is that data is documented on-site and is therefore ready for post-processing and reporting back at the office using Measurement Partner Suite BZ-5503 or other post-processing software such as Evaluator Type 7820, Protector Type 7825 or Microsoft® Excel®.

In addition to measuring broadband parameters (see Chapter 3) and spectra* (see Chapter 10), the logging module allows you to simultaneously log the following parameters:

- Broadband Parameters (including broadband statistics)
- Spectra*
- Broadband Parameters every 100 ms
- Record the measured signal†

An overview showing the options available during a typical logging task has been provided in Table 11.1.

Table 11.1 *Overview of options available during a typical logging task*

Selection	Period	Broadband Parameters	Broadband Statistics	Spectral Parameters
Logged	1 s – 24 h	1 to 10 or All (45)	None or Full	0 – 3 or All (5)
Logged (100 ms)	100 ms	None, L_{Aeq}, L_{AF} and/or L_{AS}	None available	None available
Total	Elapsed Time	All (58)	Full	All (5)

*. Requires 1/1- or 1/3-octave Frequency Analysis Software for 2250 Light BZ-7131/32

†. Requires Signal Recording Option BZ-7226

Check the *About* menu to see whether you have the license to run the Logging module. (The *About* Menu is accessed from built-in help – tap ? on the shortcut bar, then select *About*.) See Chapter 9 for instructions on installing the license for the Logging Module.

11.1 Setting up the Instrument

1) Select the **LOGGING 1/1-OCTAVE, LOGGING 1/3-OCTAVE** or **LOGGING SLM** Project Template. (section 3.3.1 for more details on templates.) The Project Template is displayed on the black banner at the top of the screen. If this banner does not display **LOGGING 1/1-OCTAVE, LOGGING 1/3-OCTAVE** or **LOGGING SLM**, tap the banner and select one of the above from the drop-down that appears.

   Note: The Logging Project Template assumes you have a license for the Frequency Analysis Software. If not, then select the **LOGGING SLM** Project template instead.

2) Depending on your memory device:
   - Insert an SD memory card in a SD card slot at the bottom of the analyzer
   - If you have hardware versions 1 – 3, you can insert a CF memory card in the CF card slot at the bottom of the analyzer
   - With hardware version 4, you can insert a USB Type A stick at the bottom of the analyzer

   You will be notified that a memory card has been inserted – select *Yes* to change the default measurement path to the memory card.

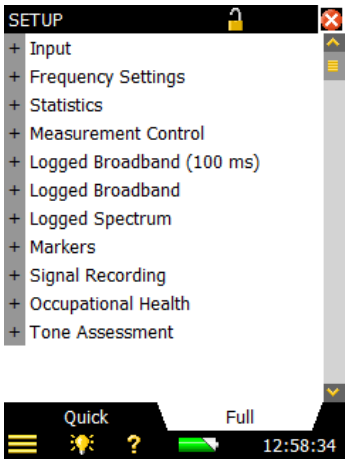
3) Tap the **Main Menu** icon and select *Explorer* from the list of options. Create a job folder for the measurements and set the default measurement job/path as described in Chapter 6.

   Note: You cannot log data on the internal disk.

4) Tap the **Main Menu** icon and select *Setup* from the list of options. The Setup screen will appear, see Fig.11.1. Set the *Input*, *Frequency Settings* and *Statistics* parameters as required for the Sound Level Meter and Frequency Analyzer‡ measurement, see Chapter 3 and Chapter 10 respectively. These settings are common to both the logging and the total measurement.

‡. Requires 1/1- or 1/3-octave Frequency Analysis Software for 2250 Light BZ-7131/32

Fig. 11.1
The Setup screen



5) Under the *Measurement Control* parameters, set the *Preset Logging Time* and *Logging Period* as required. Set *Synchronize with clock* to *Yes* if you want the logging to synchronise with whole minutes or hours. For example, if *Logging Period* is set to 1 minute and you start the measurement at 8:12:33, then the first logging interval will be from 8:12:33 to 8:12:59 (27 seconds), the second will be from 8:13:00 to 8:13:59 (60 seconds), etc. Set *Synchronize with clock* to *No* if you want every logging interval to be the specified Logging Period exactly. Set *Charge Injection Calibration* to *On*, if you want to validate the complete measurement chain by performing CIC at the start and end of the logging measurement, refer to section 5.7.

6) Under the *Logged Broadband* parameters, choose which broadband parameters you want to log in accordance with the *Measurement Control* parameters. You can choose to log *Full Statistics* per *Logging Period* or not. You can also choose to log *all* the measured *Broadband Parameters* or a *Selected* number of parameters. If you choose *Selected* then you can specify up to 10 parameters.

7) The *Logged Broadband (100 ms)* parameter allows you to log L_{Aeq} (with an elapsed time of 100 ms and a logging period of 100 ms), L_{AF} and/or L_{AS} (with a logging period of 100 ms) irrespective of the other logging parameters.

8) The *Logged Spectrum*** parameter allows you to choose which spectra to log. You can specify to log *All*, *None* or up to 3 *Selected* spectra.

9) Under *Markers* you can specify the names of the five available markers. The markers are predefined as follows:
   - Marker 1: 'Exclude' – controlled by pressing the **Back-erase** pushbutton
   - Marker 2: 'Event 1' – controlled by pressing the **Manual Event 1** pushbutton
   - Marker 3: 'Event 2' – controlled by pressing the second **Manual Event 2** pushbutton
   - Marker 4: 'Marker 4'
   - Marker 5: 'Marker 5'

**. Requires 1/1- or 1/3-octave Frequency Analysis Software for 2250 Light BZ-7131/32

All markers can be controlled by the stylus in the Profile display.

You can set a *Pre-marker Time* between 0 and 5 seconds. This will start markers 1, 2 or 3 the set number of pre-marker seconds before the point where the **Back-erase** pushbutton or the **Manual Event** pushbuttons are pressed. See section 11.3.2.

10) If you have a license for Signal Recording Option BZ-7226, you can define the settings for recording the signal while logging under the *Signal Recording* parameters. See Chapter 12 for more information.

11) If you have a license for Tone Assessment Option BZ-7231, you can define its settings under the *Tone Assessment* parameters. See Chapter 13 for more information.

11.2 Controlling the Measurement

The measurement is controlled in the same way you would control a normal Sound Level Meter measurement, using **Start/Pause**, **Continue**, **Back-erase** and **Reset** pushbuttons, see 3 for more details.

If you have set the *Charge Injection Calibration* parameter to *On*, then CIC is performed at the start of the measurement and at the end of the measurement. An Exclude marker is set on the logging profile at the point where the CIC is being performed. The update of the *Total* parameters is stopped while the CIC is being performed. You can see the results of the CIC under *Total* parameters, *CIC Result 1* and *CIC Result 2*.

Recording the Signal

If you have a license for Signal Recording Option BZ-7226, you can record the input signal during the measurement by pressing the **Manual Event 1** or **Manual Event 2** pushbutton (adds a Manual Event marker) or the **Back-erase** pushbutton (adds an Exclude marker), or you can record the signal throughout the entire measurement – depending on the *Signal Recording* setting in the **Setup**. Details in Chapter 12.

11.3 Displaying the Results

The Logging measurement screen (or Profile View) includes three tabs at the bottom: *Profile*, *Spectrum* and *Broadband* View (the Logging SLM includes the tabs: *Profile*, *Broadband* and *XL View*). The tabs allow you to choose different ways of displaying the measurement results. All but the *Profile* tab have been covered previously in Chapters 3 and 10, however a quick recap is provided below.

The *Broadband* view shows an instantaneous L_{AF} readout, with associated bar graph and a number of measurement parameters. (The first measurement parameter is displayed in a larger font size for better readability.)

The *XL View* increases the size of the first parameter readout to a 4 digit, full-screen display (including decimal point).

The *Spectrum* view shows two different spectra parameters being measured simultaneously.

11.3.1 The Profile View

The *Profile* view displays a profile of a logged broadband parameter (dB versus time). This is very convenient when marking sound categories on-line or annotating the measurement. See Fig. 11.2.

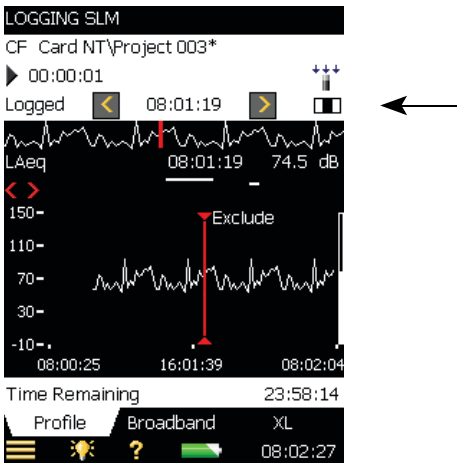


Fig. 11.2
Profile View (showing extended status field)

Status Field

The Status Field has been extended to include an extra line of information below the two existing lines of information covered previously in the Sound Level Meter and Frequency Analyzer (see Fig. 11.2).

This extra line of information allows you to:

- Select whether the results of the *Total* measurement from the *Logged* measurement, or from the *Logged(100 ms)* measurement are displayed. Select *Total* to display the measurement parameters of the Total measurement in all the views – the Broadband and Spectrum views will then display parameters or spectra similar to the Sound Level Meter or Frequency Analyzer. (The Profile View will be empty, because the Total measurement contains only a single set of parameters). Select *Logged* to display the measurement parameters from the logging intervals. The cursor in the profile selects which logging interval is displayed in all the views. Select *Logged(100 ms)* to display the L_{Aeq}, L_{AF} or L_{AS} in the profile from the 100 ms logging intervals. This setting does not display spectra or parameters in other views
- View the start time of the measurement (for *Total*) or the start time of the current logging interval (for *Logged* or *Logged(100 ms)* if measuring and the profile is not frozen) or the start time of the logging interval pointed out by the cursor. Tap on the start time in any of the views to select data from another logging interval

- View whether the display of the profile during the measurement is frozen or not. When is "animated" the display is being updated with new logged data during the measurement. You can freeze the display update by tapping on the icon. This also freezes the icon. Tap on the icon again to unfreeze the display
- Step forwards or backwards through the logging intervals on all displays, using and . (The icons are also connected to the profile cursor, so that any corresponding movement backwards or forwards through the intervals in one display will be reproduced in the other)

Some interaction with the display will automatically freeze and unfreeze the display (only while measuring):

- Tap the stylus on the profile. This will set the profile cursor and freeze the display update of the profile. You can move the cursor to any point in the profile by using the left and right arrow pushbuttons. The profile will be scrolled automatically, if necessary. Unfreeze by tapping on
- Tap and hold the stylus on the profile display and drag it to the left or right. This will freeze the display and show two cursors. Next, remove the stylus from the display and a drop-down menu appears with the possibility of setting or editing a marker or annotation (see below). Select the required function from the drop-down menu. When the function has been carried out, the profile unfreezes automatically and progresses as it did before you tapped on the screen

The logged data are displayed as two profiles. The Profile Overview with the entire profile and the Profile with 100 logging samples.

The Profile Overview

An overview of the entire profile is displayed across the screen on the topmost part of the graph area.

The overview is based on $L_{Xeq,1s}$ (X = A or B depending on the *Broadband (excl. Peak)* Frequency Settings parameter). The Y-axis is auto-zoomed.

When you have logged for more than 4 minutes, then each pixel on the X-axis will cover more than 1 s. The overview will then display from the minimum $L_{Xeq,1s}$ to the maximum $L_{Xeq,1s}$ within the interval covered by the pixels on the X-axis.

Tap in the Profile Overview to select the part of the entire profile to display in the Profile below.

The Profile

The Profile displays a hundred samples of the logged data.

Select which parameter to view by tapping the parameter field in the line above the profile.

Markers are displayed between the profile and the profile parameter. Marker 1 (Exclude) is the topmost positioned marker. The name of the marker is displayed if the marker overlaps the cursor position. If a signal has been recorded, then a Sound marker (Marker 6) is displayed above the profile – the marker covers the exact time of the signal recording.

You can browse through markers using the < > buttons in the profile.

The whole, or any part of the signal recording can be played back, once or repetitively – see Chapter 12 for details.

To the right of the profile, the broadband parameter L_{AF} is displayed and updated regardless of the measurement status and the display freeze status.

Scale the Y-axis (left-hand vertical scale of the graphical display) by tapping on the scale and accessing the drop-down menu (as in the Spectrum display):

- Select *Auto Zoom* to adjust the range of the Y-axis for best fit of the measured spectrum
- Select *Zoom In/Zoom Out* to adjust the zoom
- Select *Scale Up/Scale Down* to adjust the full scale value on the Y-axis – or select *Auto Scale* to select the best scaling for viewing the spectra – without adjusting the zoom
- *Auto Zoom* and *Auto Scale* automatically close the drop-down menu, otherwise, select *Close*, tap outside the drop-down list or use the left arrow pushbutton to close the menu

11.3.2 Marking Sound Categories

Use this facility to categorise the sound while you are measuring, or while you are observing the different kinds of sound on the display. This will make it much easier to do the post-processing and reporting back in the office.

You can mark up to five sound categories on-line. The markers are displayed as horizontal lines above the sound profile, see Fig. 11.2. There are two main types of marker:

- An Exclude Marker – this allows you to mark a sound you want to exclude from your measurement later during post-processing or reporting. (It does not remove any data from your measurement)
- An Event Marker – this allows you to mark a particular sound of interest during your measurement

On 2250 Light, Marker 1 is used as an Exclude Marker, while Markers 2 to 5 are used as Event Markers. All four event markers can be user-defined. You can define a marker by tapping on the **Main Menu** icon and selecting *Setup* > *Markers*.

Marker 2 is set to a ‘Manual Event 1’ marker by default – it can be controlled by the **Manual Event 1** pushbutton and the stylus.

Marker 3 is set to a ‘Manual Event 2’ marker by default – it can be controlled by the **Manual Event 2** pushbutton and the stylus.

Marker 6 is used as a ‘Sound’ marker and shows the size of the signal recording.

The analyzer allows you to view the markers at a later date by recalling the data and viewing the desired profile. (This can also be done if you have transferred the data to BZ-5503).

If required, Measurement Partner Suite BZ-5503, Evaluator Type 7820 and Protector Type 7825 can use the markers in their calculations. Marker number 1 (the Exclude marker) will always be used as an Exclude marker, while markers 2 to 5 will be used as defined in Type 7820/7825 software. The marker names, however, will be transferred from 2250 Light. Marker 6 will be used as a sound marker.

Marking During the Measurement

The measurement parameter is displayed as a progressing profile.

Use of pushbuttons:

Press the **Back-erase** pushbutton to start an Exclude Marker (marker number 1). The marker is displayed above the profile. Press the button once more to stop the Exclude Marker.

Press the **Manual Event** pushbutton (either or) to start a Manual Event Marker (marker number 2 or 3). The marker is displayed above the profile. Press the button once more to stop the Manual Event Marker.

Use of stylus:

Tap and hold the stylus on the profile display at the position where you want the marker to start. This will freeze the display and show a cursor at the position of the stylus. Then drag the stylus left or right to the position where you want the marker to end. This will display a second cursor. Next, remove the stylus from the display and a drop-down menu appears showing the five markers you have specified in the setup. Select the marker you require. The marker is displayed above the profile, the cursors disappear and the profile unfreezes and progresses as it did before you tapped on the screen.

Marking Measurement While it is Paused

The measurement parameter is displayed as a profile while the measurement is paused.

You can use the stylus to mark the sound categories:

Tap and hold the stylus in the profile display at the position where you want the marker to start. This will display a cursor at the position of the stylus. Then drag the stylus left or right to the position where you want the marker to end. This will display a second cursor. Next, remove the stylus from the display and a drop-down menu appears showing the five markers you have specified in the setup. Select the marker you require. The marker is displayed above the profile and the cursors disappear.

11.3.3 Editing Markers on Profiles

To widen a marker:

1) Tap and hold the stylus on the profile display at a position within the marker range.
2) Drag the stylus left or right to the position where you want the marker to end.
3) Remove the stylus from the display and a drop-down menu appears.
4) Select the marker you want to widen from the drop-down menu.

To narrow a marker:

1) Tap and hold the stylus on the profile display at the position inside the marker range where you want it to stop.
2) Drag the stylus left or right to a position outside the marker range.
3) Remove the stylus from the display and a drop-down menu appears.
4) Select *Delete* for the marker you want to narrow from the drop-down menu. The part where the marker overlaps the gap between the two cursors will be deleted.

To delete a marker:

1) Tap and hold the stylus in the profile display at a position to the left of the marker you want to delete.
2) Drag the stylus to a position to the right of the marker.
3) Remove the stylus from the display and a drop-down menu appears.
4) Select *Delete* for the marker you want to delete from the drop-down menu.

11.4 Saving and Recalling Results

Measurements are saved and can be viewed later, in the same way as described for the Sound Level Meter Project in Chapters 3 and 6.

Chapter 12

Signal Recording (Optional Module)

Signal Recording Option BZ-7226 allows you to record the input signal (typically sound) in either 16-bit or 24-bit resolution during measurement. The signal recording can be controlled manually or by using an external trigger signal. The recorded sound can be played back and listened to using the optional Earphones HT-0015. Sound is recorded directly to a memory card. With hardware version 4, sound can also be recorded to a USB memory stick.

The main benefit is that data is documented on-site and is therefore ready for post-processing and reporting back at the office using Measurement Partner Suite BZ-5503 or other post-processing software such as Evaluator Type 7820, Protector Type 7825 or Microsoft® Excel®.

Check the **About** menu to see whether you have the right license to run the Signal Recording module. (The **About** menu is accessed from built-in help – tap ? on the Shortcut Bar, then select **About**.) See Chapter 9 for instructions on installing the license for the Signal Recording Module.

12.1 With Sound Level Meter and Frequency Analysis Software

You can use the Signal Recording facility together with the Sound Level Meter Software and the Frequency Analysis Software. You can record the sound for the whole measurement period or you can record sound for controlled parts of the measurement. The recordings are attached to the project as annotations, named “Soundrec N”, where N is the number of the recording for the project. (section 3.5 and section 6.3.2 for a description of how to use annotations.)

Note 1: Signal recordings can only be done during measurements.

Note 2: Signal recordings can only be done on projects saved on memory cards (or with hardware version 4, from a USB memory stick).

12.1.1 Setting up the Analyzer

1) Select a **Sound Level Meter** project template or a **Frequency Analyzer** project template. (see section 3.3.1 for more details on templates.)

2) Depending on your memory device:
   - Insert an SD memory card in a SD card slot at the bottom of the analyzer
   - If you have hardware versions 1 – 3, you can insert a CF memory card in the CF card slot at the bottom of the analyzer
   - With hardware version 4, you can insert a USB Type A stick at the bottom of the analyzer

   Note: You cannot record the signal on the internal disk.

3) Tap the **Main Menu** icon and select *Explorer* from the list of options. Navigate to the memory card, create a job folder for the measurements and set the default measurement job/path as described in Chapter 6.

4) Tap the **Main Menu** icon and select *Setup* from the list of options. Set all the parameters as required for the Sound Level Meter or Frequency Analyzer measurement, see Chapter 3 and Chapter 10, respectively.

5) Under *Signal Recording* you can specify the *Recording Control* parameters as follows:
   - *Automatic*, if you want to start the recording when you start the measurement and stop when you pause the measurement, and to limit the recording to *Maximum Duration*, if *Duration Limit* is set to *On*
   - *Manual Event*, if you want to start and stop the recording using the **Manual Event** pushbutton during the measurement and to limit the duration of the recording, if *Duration Limit* is set to *On*. In this case the recording will be at least *Minimum Duration* long, but no longer than the *Maximum Duration*. Use *Pre-recording Time* and *Post-recording Time* to specify how much extra you want to be recorded before and after the event
   - *External Event*, if you want to start and stop the recording using an external trigger signal, connected to the Trigger Input. See details in Appendix A
   - *Off*, if you do not want to record the signal

6) Set *Recording Quality* to *High*, *Medium*, *Fair* or *Low* in accordance with your needs. Note, however, that high quality requires more disk space than low quality – details in Appendix A.

7) Set *Recorded Signal* to either *Input A/B-weighted*, *Input C-weighted* or *Input Z-weighted* (A/B-weighting is determined by setting the parameter in *Setup > Frequency Settings > Broadband (excl. Peak)*). Input C-weighted is suitable for recordings used afterwards to identify the sound source – it contains all the audible content of the signal, but reduces the low-frequency noise from wind, etc.

8) Set *Automatic Gain Control* to *On* if you just want to listen to the signal afterwards. The full 120 dB dynamic range (from max.input level and down) will be converted to 40 dB and the signal is stored as a 16-bit WAV file.

Set *Automatic Gain Control* to *Off* if you need to record calibrated signals or need to analyze the wav-file afterwards on a PC. Select *Resolution = 24 bit* (recommended) to cover the full 120 dB dynamic range (from max. input level and down) or select *Resolution = 16 bit* and specify the *Peak Recording Level*.

9) Under *Input* you specify *Trigger Input* if you want to start the signal recording using an external trigger signal. See details in Appendix A.

To exit the screen, tap .

12.1.2 Controlling the Recording

The measurement is controlled in the same way you would control a normal Sound Level Meter measurement, using **Start**/**Pause**, **Continue**, **Reset** and **Save** pushbuttons, see Chapter 3 for more details.

When the measurement signal is being recorded, the **Recording** icon is displayed in the Status Field. The recording is attached to the project as an annotation. The **Annotations** icon is then displayed to indicate that the project has been annotated.

When *Recording Control* is set to *Automatic*, the recording will start when the measurement is started and last for the *Maximum Duration* or the *Elapsed Time*, whichever is smallest. If you continue a paused measurement, then a new recording is started.

When *Recording Control* is set to *Manual Event*, the recording will start the first time you press the **Manual Event** pushbutton during the measurement, and stop the second time you press it; if you press it a second time before the *Minimum Duration* has elapsed, then the recording will continue until *Minimum Duration* has elapsed; if you press it a second time after *Maximum Duration* has elapsed, then the recording has already been stopped when *Maximum Duration* elapsed and the pushbutton will initiate a new recording instead.

When *Recording Control* is set to *External Event*, and *Trigger Input* is set to *Voltage Level*, then recording is started when the voltage level is ‘high’ and stopped when voltage level is ‘low’ (details in Appendix A). *Duration Limit* has no effect on this setting.

If *Pre-recording Time* has been set, then the recording will start this time before you hit the **Manual Event** pushbutton. This is possible because the recording is done continuously in an internal buffer, ready to be saved as a wave file. The *Pre-recording Time* is limited by this buffer size and the Recording Quality – details in Appendix A.

Note: Very long signal recordings will be split into wave files containing maximum 10 minutes, that is, a 35-minute signal recording will consist of 4 wave files, three with 10 minutes of sound and one with 5 minutes of sound.

12.1.3 Playing the Recording

Signal recordings are attached to the measurement project as annotations. The **Annotations** icon is displayed in the Status Field to indicate this. Tap to open the list of annotations. With hardware version 4, you can tap the annotation to play it back – details in Chapter 3 and Chapter 6.

12.2 With Logging Software

You can use the Signal Recording facility together with the Logging Software. You can record the sound for the whole measurement period or you can record sound for controlled parts of the measurement. The recordings are attached to the profile as sound markers. The signal recordings can be controlled by the **Manual Event** pushbuttons, the **Back-erase** pushbutton, or an external trigger signal. You can also control the signal recording using the stylus to mark the interesting part on the profile.

Note 1: Signal recordings can only be done during measurements.

Note 2: Signal recordings can only be done on projects saved on memory cards (or with hardware version 4, from a USB memory stick).

12.2.1 Setting up the Analyzer

1) Select a Logging, 1/1 octave, Logging 1/3 octave, or Logging SLM project template. (see section 3.3.1 for more details on templates.)

2) Depending on your memory device:
   - Insert an SD memory card in a SD card slot at the bottom of the analyzer
   - If you have hardware versions 1 – 3, you can insert a CF memory card in the CF card slot at the bottom of the analyzer
   - With hardware version 4, you can insert a USB Type A stick at the bottom of the analyzer

   Note: You cannot record the signal on the internal disk.

3) Tap the **Main Menu** icon and select *Explorer* from the list of options. Navigate to the memory card, create a job folder for the measurements and set the default measurement job/path as described in Chapter 6.

4) Tap the **Main Menu** icon and select *Setup* from the list of options. Set all the parameters as required for the Logging measurement, see Chapter 11.

5) Under *Signal Recording* you can specify the *Recording Control* parameters as follows:
   - *Automatic*, if you want to start the recording when you start the measurement and stop when you pause the measurement, and to limit the recording to *Maximum Duration*, if *Duration Limit* is set to *On*
   - *Manual Event*, if you want to start and stop the recording using the **Manual Event 1** or **Manual Event 2** pushbutton during the measurement
   - *Exclude Event*, if you want to start and stop the recording using the **Back-erase** pushbutton during the measurement
   - *External Event*, if you want to start and stop the recording using an external trigger signal, connected to the Trigger Input

- *All Events*, if you want to start and stop the recording based on any of the events

  Note: When *Recording Control* set to any of the events, you can limit the duration of the recording, if *Duration Limit* is set to *On*. In this case the recording will be at least *Minimum Duration* long, but no longer than the *Maximum Duration*. Use *Pre-recording Time* and *Post-recording Time* to specify how much extra you want to be recorded before and after the event
- *Off*, if you do not want to record the signal

6) Set *Recording Quality* to *High*, *Medium*, *Fair* or *Low* in accordance with your needs, note, however, that the high quality requires more disk space than low quality – details in Appendix A.

7) Set *Recorded Signal* to either *Input A/B-weighted*, *Input C-weighted* or *Input Z-weighted* (A/B-weighting is determined by setting the parameter in *Setup > Frequency Settings > Broadband (excl. Peak)*). Input C-weighted is suitable for recordings used afterwards to identify the sound source – it contains all the audible content of the signal, but reduces the low-frequency noise from wind, etc.

8) Set *Automatic Gain Control* to *On* if you just want to listen to the signal afterwards. The full 120 dB dynamic range (from max.input level and down) will be converted to 40 dB and the signal is stored as a 16-bit wav-file.

   Set *Automatic Gain Control* to *Off* if you need to record calibrated signals or need to analyze the wav-file afterwards on a PC. Select *Resolution = 24 bit* (recommended) to cover the full 120 dB dynamic range (from max. input level and down) or select *Resolution = 16 bit* and specify the *Peak Recording Level*.

9) Under *Input* you specify *Trigger Input* if you want to start the recording using an external trigger signal. See details in Appendix A.

To exit the screen, tap .

12.2.2 Controlling the Recording

The measurement is controlled in the same way you would control a normal Sound Level Meter measurement, using **Start/Pause**, **Continue**, **Back-erase** and **Reset** pushbuttons, see 3 for more details.

When the measurement signal is being recorded, then the **Recording** icon is displayed in the Status Field. The recording is attached to the profile as a Marker 6 (Sound).

If you set *Recording Control* to *Automatic*, the recording will start when the measurement is started and last for *Maximum Duration* or *Elapsed Time*, whichever is smallest. If you continue a paused measurement, then a new recording is started.

If you set *Recording Control* to *Manual Event*, the recording will start the first time you press the **Manual Event** pushbutton during the measurement (this starts a Manual Event marker and a Sound marker), and stop the second time you press it; if you press it a second time before *Minimum Duration* has elapsed, then the recording will continue until *Minimum Duration* has

elapsed; if you press it a second time after *Maximum Duration* has elapsed, then the recording has already stopped when *Maximum Duration* elapsed, and the pressing the button will have no effect on the signal recording (the Manual Event marker, however, is stopped).

If you set *Recording Control* to *Exclude Event*, the recording will start the first time you press the **Back-Erase** pushbutton during the measurement (this starts an Exclude Event marker and a Sound marker), and stop the second time you press it – the behaviour will be similar to control by the **Manual Event** pushbutton.

When *Recording Control* is set to *External Event*, and *Trigger Input* is set to *Voltage Level*, then recording is started when the voltage level is 'high' and stopped when voltage level is 'low' (details in Appendix A). *Duration Limit* has no effect on this setting.

If you set *Recording Control* to *All Events*, the recording will start when any of the events above become active, and stop when all events are inactive again.

If *Pre-recording Time* has been set, then the recording will start this time before the Event appears. This is possible because the recording is done continuously in an internal buffer, ready to be saved as a wave file. The Pre-recording Time is limited by this buffer size and the Recording Quality – details in Appendix A.

Note: Very long signal recordings will be split into wave files containing maximum 10 minutes, that is, a 35-minute signal recording will consist of 4 wave files, three with 10 minutes of sound and one with 5 minutes of sound.

12.2.3 Control Recording using the Stylus

If *Recording Control* is set to any of the events, or to *All Events*, the recording can also be controlled using the stylus directly on the profile, in the same way as you mark sound categories – details in Chapter 11.

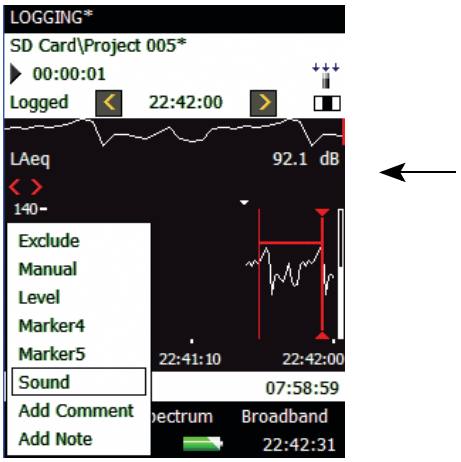


Fig. 12.1
Example Logging display (showing internal buffer marker)

The small triangle above the profile indicates the amount of sound you have in the internal buffer – ready for storage in a wave-file. You will have sound from this triangle to the right-hand side of the profile. The triangle is updated every second.

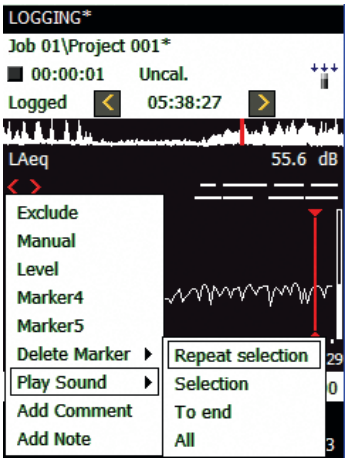
To make a signal recording using the stylus, you tap and hold the stylus on the profile display and drag it to the position where the signal recording should end, then you remove the stylus and get a drop-down menu with the possibility of setting one of the six markers. If you select *Sound*, then a sound marker is made and the sound for the marked interval is stored in a wave file. Only the portion of the sound available in the internal buffer (to the right of the small triangle) will be stored and the sound marker will only indicate this part.

Note: When selecting an interval for storing (or setting a marker), the profile display freezes, but the signal recording is still updated in the internal buffer. The part of the buffer available on the screen will decrease and you will see the small triangle move to the right. Be sure not to wait too long in selecting the *Sound marker* from the drop-down menu – otherwise the signal recording will disappear from the internal buffer.

12.2.4 Playing the Recording*

With your G4 analyzer, you can playback the sound simply by selecting part of the marker – as described in section 11.3.3 – and choose *Play Sound* from the resulting drop-down menu. The following drop-down menu will then appear, see Fig. 12.2.

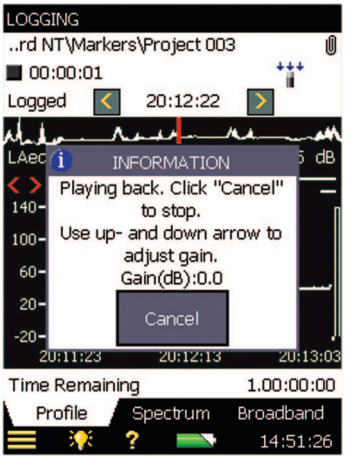
Fig. 12.2
Playing the recording – the drop-down menu



Select one of the four ways of playing a sound: *Selection* will play the part you have selected; *Repeat Selection* will play the selected part until you press *Cancel* on the pop-up menu; *To End* will play the sound from the position you selected the sound marker to the end; and finally *All* will play the entire signal recording, regardless of your selection point.

*. Playback on the analyzer is available only with hardware version 4. If you have hardware versions 1 – 3, you can play back recordings on a PC using Measurement Partner Suite BZ-5503. See section 12.2.5 for more information.

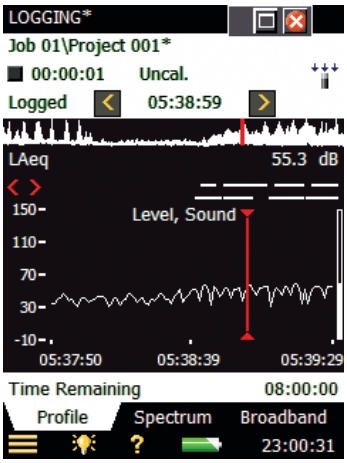
Fig. 12.3
Playing the recording – output level pop-up



When you have selected the method of play-back, a pop-up appears explaining how to adjust the output level in the headphone and how to stop the play-back.

Tap the **Minimize** button to reduce this to a small blue bar at the top of the screen – allowing you to watch the profile underneath – you will notice that the profile cursor is updated every second to the position of the sound that is currently being played.

Fig. 12.4
Playing the recording – minimizing the pop-up



The small blue button bar at the top can be maximized again by tapping the icon, or you can close it and stop playing back by tapping .

12.2.5 Signal Recordings on the PC

When projects including signal recording have been transferred into an Archive on a PC using BZ-5503, then the recordings can be played back directly from BZ-5503.

Signal Recordings can be input to the Brüel & Kjær PULSE Multi-Analyzer platform for further analysis – please contact your local Brüel & Kjær representative for further information.

Note: When recording signals for further analysis in PULSE, be sure to record the Z-weighted signal and select *Automatic Gain Control* to *Off* under the *Signal Recording* parameters and select the *Recording Quality* to match your needs for frequency content – see details on sampling frequency in Appendix A.

When *Automatic Gain Control* is set to *Off*, then the calibration information is stored in the wave files – allowing PULSE to analyse the signal recordings, taking the calibration into account.

Note: Other sound players than BZ-5503 might not be able to amplify "24-bit per sample" wav-files enough to hear weak sounds. If this is needed, then use 16-bit per sample.

Chapter 13

Tone Assessment Option BZ-7231 – 1/3-octave Method

13.1 General

Tone Assessment Option BZ-7231 includes tone assessment according to the ISO standard. It allows assessment of tones on-site.

The result of the tone assessment is the adjustment to be added to the L_{Aeq} as described in the standard for calculating rating level.

BZ-7231, when used with 1/3-octave Frequency Analysis Software BZ-7132 and Logging Software BZ-7133, allows you to:

- Assess tones in a measured 1/3-octave spectrum according to ISO 1996:2007, Annex D

Tone Assessment Option BZ-7231 brings results to the user on-site as well as preparing for post-processing and reporting back at the office. Documentation can be completed using Measurement Partner Suite BZ-5503, or the measured data can be exported for post-processing by Evaluator Type 7820 or other post-processing software such as Microsoft® Excel®.

Check the *About* menu to see whether you have the right license to run the Tone Assessment Option. (The *About* menu is accessed from built-in help – tap the **Help** icon ? on the Shortcut Bar, then select *About*.)

If you have purchased your analyzer together with the software application(s), then the relevant license(s) comes pre-installed.

If you purchased a separate software application for your analyzer, then you have to install the license on the analyzer. This is done using BZ-5503, please consult the on-line help included with the BZ-5503 software for instructions on how to install a license.

13.2 Tone Assessment According to ISO 1996-2, Annex D

When assessing noise, it is generally recognised that noise containing audible pure tones is more annoying than noise with the same A-weighted broadband level that does not contain audible tones. When assessing noise that contains tones or narrow bands of noise, an adjustment shall be added to the A-weighted time averaged level, L_{Aeq}. The first evaluation of audible tones in noise is most often carried out by the human ear. But for comparative analysis results, and documentation, an objective analysis may be needed.

Tone Assessment can be performed using the ISO 1996-2:2007 standard "Determination of environmental noise levels", Annex D: "Objective method for assessing the audibility of tones in noise – Simplified method". This method uses 1/3-octave measurements.

The selection of method depends on local legislation, which may refer to ISO 1996-2 or a local method.

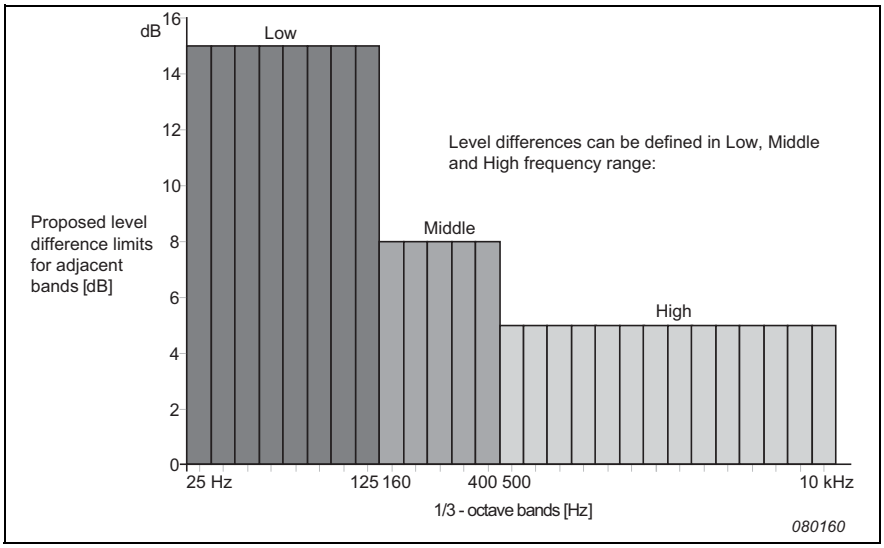
Find more information about rating level and assessment of environmental noise in ISO 1996-2 and in Brüel & Kjær's Environmental Booklet.

13.2.1 ISO 1996-2, Annex D – Tone Assessment Calculations

The ISO method searches a measured, time averaged (L_{eq}) spectrum, for level differences between adjacent 1/3-octave bands. If the level difference between a 1/3-octave band and the band either side of it are higher than a certain limit, an adjustment for audible tones may be added to the L_{Aeq} level when calculating the rating level, L_r.

In ISO 1996-2, Annex D, the spectrum is divided into three frequency ranges: Low, Middle and High. In each frequency range a specific limit for the level differences leading to an adjustment is defined, see Fig. 13.1.

Fig. 13.1 *Definition of frequency ranges and level differences*



The proposed frequency ranges and level differences between adjacent bands are:

- **Low frequency range:** includes the 1/3-octave bands from 25 Hz to 125 Hz with a level difference for a detected tone greater than 15 dB
- **Middle frequency range:** includes the 1/3-octave bands from 160 Hz to 400 Hz with a level difference for a detected tone greater than 8 dB
- **High frequency range:** includes the 1/3-octave bands from 500 Hz to 10 kHz with a level difference for a detected tone greater than 5 dB

With BZ-7231 software, frequency ranges and the limit for the level differences in low, middle and high range can be set by the user.

Tone assessment is carried out for all the measured frequency bands (including those below 25 Hz and above 10 kHz). The level difference limit is extrapolated from the low and high range to cover the complete measurement range.

If tones are detected outside the 25 Hz to 10 kHz range, the quality indicator (yellow smiley) indicates “Tone out of ISO range detected”.

ISO 1996-2, Annex D does not specify the size of the adjustment. In the default setting of BZ-7231, Brüel & Kjær has chosen to set the value to 5 dB.

Calculating the Level Difference Between One Band and the Adjacent Bands

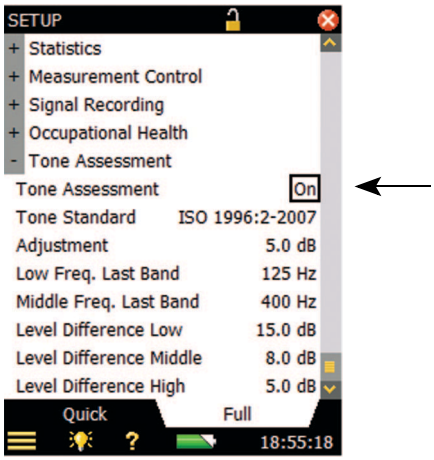
BZ-7231 software calculates the level difference between a 1/3-octave band and two adjacent 1/3-octave bands with lower levels. The difference is calculated between the band in the middle and the highest of the adjacent bands.

13.3 Setting up the Analyzer

13.3.1 Selecting the Tone Assessment Option

Tap the **Main Menu** icon then *Setup* from the list of options. Under the *Tone Assessment* parameters (on the full list of options) tap *Tone Assessment* and set it to *On* (Fig. 13.2).

Fig. 13.2
Setting Tone Assessment option to On

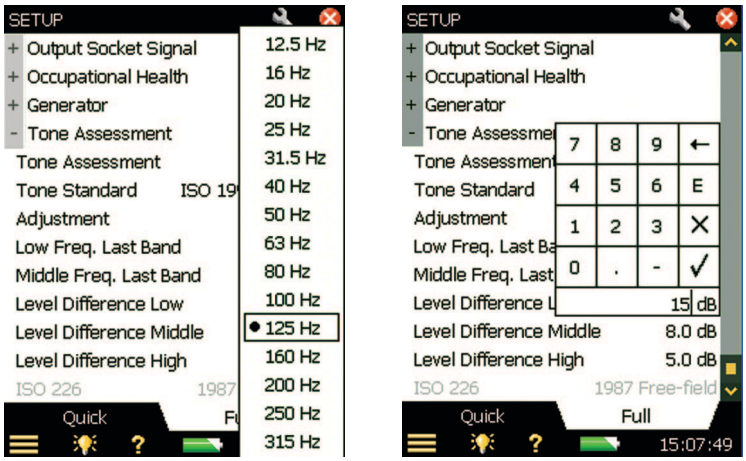


13.3.2 Setting up a Measurement Manually

ISO 1996–2, Annex D

You can set the division between the Low and Middle frequency range, the division between the Middle and High frequency range, and the limits for the level differences between adjacent bands (Fig. 13.3). (See Fig. 13.1 for a definition of the frequency ranges and level differences.)

Fig. 13.3
Left: *Setting the 'Low Freq. Last Band' parameter*
Right: *Setting the 'Level Difference Low' parameter*



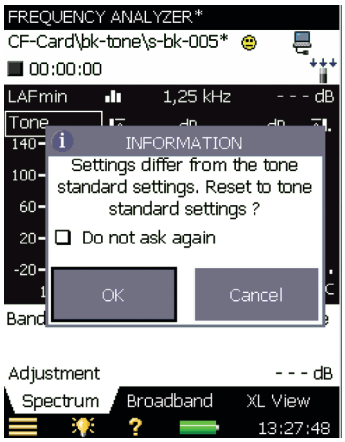
You set the division between the Low/Middle frequency range by selecting the required value for the *Last* (or highest) *Band* in the Low frequency range (from 12.5 Hz to 315 Hz), and set the division between the Middle/High frequency range by selecting the required value for the *Last* (or highest) *Band* in the Middle frequency range (from 160 Hz to 20 kHz).

The ISO method does not state which frequency weighting should be used, so in the default setup, A-weighing is selected. However, this is not described in the ISO method, so no warnings will be generated if you select other frequency weightings.

13.3.3 Setting up the Measurement using the Default Setup

Select the *Tone* parameter above the spectrum and start the measurement by pressing the **Start/Pause** pushbutton. If the selected setup parameters do not comply with the selected tone assessment method, the following pop-up window will be displayed:

Fig. 13.4
Pop-up window for tone measurement setup check



The pop-up window can be de-activated for the rest of the measurement session. To activate it again, you will have to reload the template or restart your analyzer. This automatic check is deactivated when the *Tone Assessment* parameter is set to *Off* in the **Setup** menu.

To reset all the relevant parameters to the default setup, tap the **OK** button. (The default setup includes preset parameters that comply with the selected standard. These are described in Table 13.1.) To measure with the settings you set up manually, tap the **Cancel** button.

Table 13.1
Default parameters used by the automatic measurement setup check

Setup Parameter	Default Value
Standard: ISO 1996-2, Annex D	
Adjustment	3 dB
Last band in low frequency range	125 Hz
Last band in middle frequency range	400 Hz
Level difference low	15 dB
Level difference middle	8 dB
Level difference high	5 dB

Note: Even if you have set the *Tone Assessment* parameter to *On* (*Setup* menu), the calculation is not carried out until the *Tone* parameter is selected above the spectrum.

13.3.4 Signal Recording

If a valid license for the Signal Recording Option BZ-7226 is present, it is possible to record the sound while measuring. (Refer to Chapter 12 for information about the Signal Recording Option.)

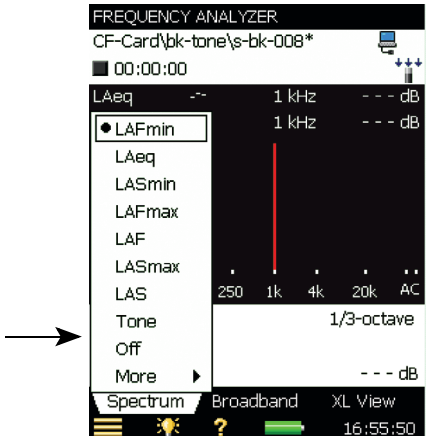
Note: When signal recordings are to be used for re-analysis on a PC, be sure to set *Automatic Gain Control* parameter to *Off*, under the *Signal Recording* parameters, and set the *Recording Quality* parameter to *High* and *Resolution* to *24 bit*.

13.4 Measuring

13.4.1 Result Display

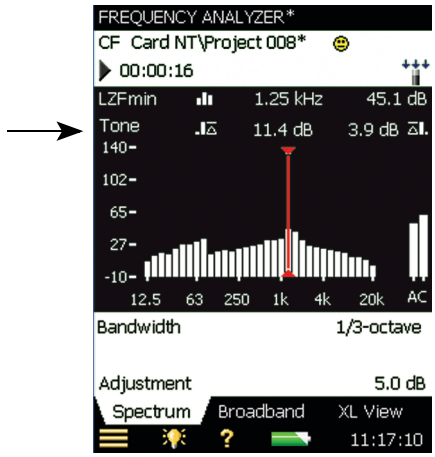
Tone assessment is not performed until the *Tone* parameter is selected above the spectrum. (This is done by tapping one of the parameter fields in the two lines above the Spectrum display and choosing *Tone* from the drop-down menu.) Once selected, tone assessment is carried out on the selected spectrum. The results are updated during the measurement.

Fig. 13.5
Selecting the Tone parameter above the spectrum display



On the Results display, a blue marker is set at the top of each detected band with a tone. Differences to the left and right of the frequency band selected by the main cursor are shown (on the left and right) in the tone parameter panel above the spectrum, see Fig. 13.6. The main cursor is moved using either the hard keys or the stylus.

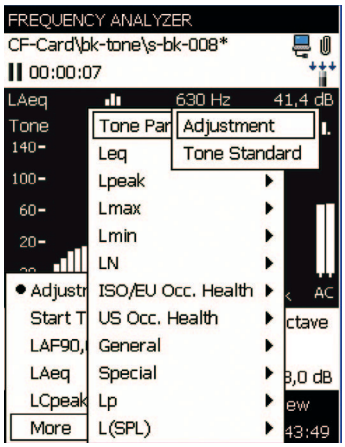
Fig. 13.6
The differences to the left and right of the selected frequency band are shown in the tone parameter panel – in this example, there is a 11.4 dB difference to the left and a 3.9 dB difference to the right



The information shown in the value panel can be changed by tapping in the field. From the tone parameters, the adjustment and the selected tone standard can be selected. See Fig. 13.7.

Results from the tone assessment can also be found by tapping on the **Broadband** tab and browsing the **Broadband** view in a similar way.

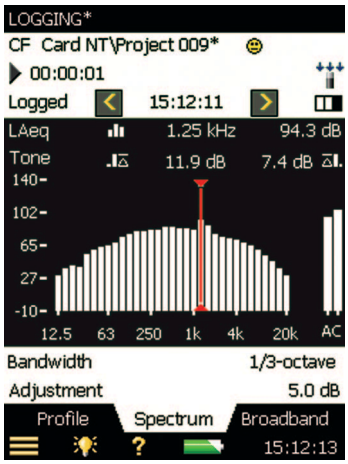
Fig. 13.7
Changing the information shown in the value panel



13.5 Logging Software BZ-7133 Template

The results from the tone assessment can be found in the *Spectrum* view of the Logging template. Tone assessment is performed for each logging period, as well as for the total measurement time, see Fig. 13.8.

Fig. 13.8
Viewing results on the logging template

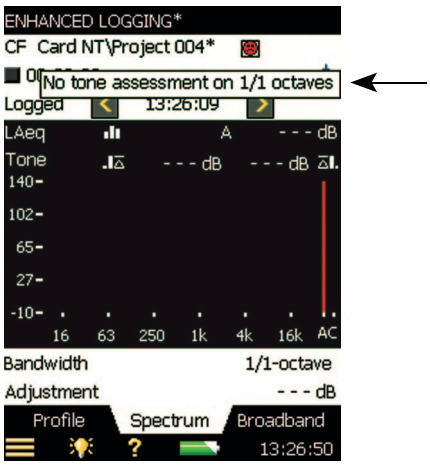


Please find more information about setting up a Logging measurement in Chapter 11.

13.6 Status Codes (Smileys)

When *Tone* is selected on the tone parameter panel, the list of status codes is updated. Tap a smiley to get an explanation of the status code, and for a tip on how to remedy or improve the settings on the analyzer, see an example in Fig. 13.9.

Fig. 13.9
Example of a status code explanation



If you have selected *1/1-octave* or a *Direct* input, tone assessment will be performed, but a smiley will be displayed. When you tap the smiley it will advise you to use a *Microphone*.

For an overview of all the remedies associated to the various smileys, please refer to Table 13.2

Table 13.2 *Overview of smileys and associated remedies*

Smiley	Colour	Explanation	Remedy – Tip for Solution
	Red	No tone assessment on 1/1 octaves	There is no method for assessing tones when the spectrum is analysed in 1/1-octave bands, select 1/3-octave instead
	Red	No tone assessment on inst. parameters	It is not possible to make tone assessments on instantaneous parameters (‘Fast’ or ‘Slow’)
	Yellow	Analysis on ‘Direct’	The analysis is carried out on a ‘Direct’ input, select a microphone
	Yellow	Setup different from ISO standard	The ISO is selected and the measurement setup deviates from the proposals in the ISO standard
	Yellow	Min or Max spectrum	When the ISO standard is selected the analyzed spectrum should be L_{eq}
	Yellow	Tone freq outside proposed ISO range	In the ISO standard the defined frequency range for tone assessment is from 25 Hz to 10 kHz. A tone is detected outside this frequency range

Note: The ISO method does not specify the weighting filter to be used. The A-weighting filter is selected by default, but all selectable broadband filters may be applied without warnings.

13.7 Recalling Saved Measurements

Saved measurements using the **Frequency Analyzer**, **1/3 Oct.** and **Logging** templates can be opened and the Tone Assessment can be applied. Please refer to section 3.4 and section 6.3 for information on how to save and recall measurements, respectively.

Chapter 14

Specifications

This chapter comprises the specifications that are needed for evaluation of instrument performance characteristics and proper use of the instrument. Some of the applicable sound level meter standards require additional technical documentation, in particular for pattern evaluation (type approval) purposes, but have no bearing on normal use. The additional technical documentation is given in a separate Brüel & Kjær manual.

Hand-held Analyzer Type 2250-L (2250 Light) Platform

Specifications apply to 2250 Light fitted with Microphone Type 4950 and Microphone Preamplifier ZC-0032:

Microphone

SUPPLIED MICROPHONE
Type 4950: Prepolarized Free-field ½″ Microphone
Nominal Open-circuit Sensitivity: 50 mV/Pa (corresponding to −26 dB re 1 V/Pa) ±2 dB
Capacitance: 12.5 pF (at 250 Hz)

MICROPHONE PREAMPLIFIER ZC-0032
Nominal Preamplifier Attenuation: 0.3 dB
Connector: 10-pin LEMO
Extension Cables: Up to 100 m in length between the microphone preamplifier and 2250 Light, without degradation of the specifications

MICROPHONE POLARIZATION VOLTAGE
Selectable between 0 V and 200 V (hardware version 4 only)

SELF-GENERATED NOISE LEVEL
Typical values at 23°C for nominal microphone open-circuit sensitivity:

Weighting	Microphone	Electrical	Total
A	14.0 dB	12.7 dB	16.4 dB
B	12.9 dB	11.9 dB	15.4 dB
C	13.0 dB	13.6 dB	16.3dB
Z 5 Hz–20 kHz	14.4 dB	19.3 dB	20.5 dB

Interface

KEYBOARD
Pushbuttons: 11 keys with backlight, optimised for measurement control and screen navigation

ON-OFF BUTTON
Function: Press 1 s to turn on; press 1 s to enter standby; press for more than 5 s to switch off

STATUS INDICATORS
LEDs: Red, amber and green

DISPLAY
Type: Transflective back-lit touch screen, 240 × 320 dot matrix
Black and white scheme
Backlight: Adjustable level and on-time

USER INTERFACE
Measurement Control: Using pushbuttons on keyboard
Setup and Display of Results: Using stylus on touch screen or pushbuttons on keyboard
Lock: Keyboard and touch screen can be locked and unlocked

USB INTERFACE
Hardware Versions 1 to 3: USB 1.1 OTG Mini B socket
Hardware Version 4: USB 2.0 OTG Micro AB and USB 2.0 Standard A sockets

MODEM INTERFACE
Connection to Internet through GPRS/EDGE/HSPA modem connected through:
- The Compact Flash slot (hardware versions 1 – 3)
- The USB Standard A Socket (hardware version 4)

Supports DynDNS for automatic update of IP address of host name

PRINTER INTERFACE
PCL printers, Mobile Pro Spectrum thermal printer or Seiko DPU S245/S445 thermal printers can be connected to USB socket

Inputs/Outputs

COMPACT FLASH SOCKET (Hardware Versions 1 to 3 only)
Connection of CF memory card, CF modem, CF to serial interface, CF Ethernet interface or CF WLAN interface

SECURE DIGITAL SOCKET
- 1 × SD socket for hardware versions 1 – 3
- 2 × SD sockets for hardware version 4

Connect SD and SDHC memory cards

LAN INTERFACE SOCKET (Hardware Version 4 only)
- Connector: RJ 45 Auto-MDIX
- Speed: 100 Mbps
- Protocol: TCP/IP

TRIGGER SOCKET
Connector: Triaxial LEMO
Max. Input Voltage: ±20 Vpeak
Input Impedance: >47 kW
Precision: ±0.1 V

HEADPHONE SOCKET
Connector: 3.5 mm Minijack stereo socket
Max. Peak Output Level: ±1.4 V
Output Impedance: 32 Ω in each channel

Power

EXTERNAL DC POWER SUPPLY REQUIREMENTS
Used to charge the battery pack in the instrument
Voltage: 8–24 V DC, ripple voltage <20 mV
Current Requirement: min. 1.5 A
Power Consumption: <2.5 W, without battery charging, <10 W when charging
Cable Connector: LEMO Type FFA.00, positive at centre pin

EXTERNAL AC MAIN SUPPLY ADAPTOR
Part No.: ZG-0426
Supply Voltage: 100 to 120/200 to 240 V AC; 47 to 63 Hz
Connector: 2-pin IEC 320

BATTERY PACK
Rechargeable Li-Ion battery
Part No.: QB-0061
Voltage: 3.7 V
Capacity: 5200 mAh nominal
Typical Operating Time: >10 h (screen backlight dimmed); >7 h (full screen backlight)
Battery Cycle Life: >500 complete charge/discharge cycles
Battery Indicator: Remaining battery capacity and expected working time may be read out in % and time
Battery Fuel Gauge: The battery is equipped with a built-in fuel gauge, which continuously measures and stores the actual battery capacity in the battery unit
Charge Time: In instrument, typically 10 hours from empty at ambient temperatures below 30°C. To protect the battery, charging will be terminated completely at ambient temperatures above 40°C. At 30 to 40°C charging time will be prolonged. With External Charger ZG-0444 (optional accessory), typically five hours
Note: It is not recommended to charge the battery at temperatures below 0°C (32°F) or over 50°C (122°F). Doing this will reduce battery lifetime

CLOCK
Back-up battery powered clock. Drift <0.45 s per 24-hour period

Storage

INTERNAL FLASH-RAM (NON-VOLATILE)
20 Mbyte for user setups and measurement data

EXTERNAL MEMORY CARD
Secure Digital (SD and SDHC) Card: For store/recall of measurement data
Compact Flash (CF) Card: Hardware versions 1 – 3 only. For store/recall of measurement data

USB MEMORY STICK (Hardware Version 4 only)
For store/recall of measurement data

Environmental

WARM-UP TIME
From Power Off: <2 minutes
From Standby: <10 seconds

TEMPERATURE
IEC 60068–2–1 & IEC 60068–2–2: Environmental Testing. Cold and Dry Heat
Operating Temperature: –10 to +50°C (14 to 122°F), <0.1 dB
Storage Temperature: –25 to +70°C (–13 to +158°F)

HUMIDITY
IEC 60068–2–78: Damp Heat: 90% RH (non-condensing at 40°C (104°F))
Effect of Humidity: < 0.1 dB for 0% < RH < 90% (at 40°C (104°F) and 1 kHz)

MECHANICAL
Environmental Protection: IP 44
Non-operating:
- IEC 60068–2–6: Vibration: 0.3 mm, 20 m/s^2, 10 – 500 Hz
- IEC 60068–2–27: Shock: 1000 m/s^2
- IEC 60068–2–29: Bump: 4000 bumps at 400 m/s^2

WEIGHT AND DIMENSIONS
650 g (23 oz.) including rechargeable battery
300 × 93 × 50 mm (11.8 × 3.7 × 1.9″) including preamplifier and microphone

User Interface

LANGUAGE
User Interface in Catalan, Chinese (People's Republic of China), Chinese (Taiwan), Croatian, Czech, Danish, English, Flemish, French, German, Hungarian, Japanese, Italian, Korean, Polish, Portuguese, Romanian, Russian, Serbian, Slovenian, Spanish, Swedish, Turkish and Ukrainian

HELP
Concise context-sensitive help in English, French, German, Italian, Japanese, Korean, Polish, Portuguese, Romanian, Serbian, Slovenian and Spanish

UPDATE OF SOFTWARE
Update to any version using BZ-5503 through USB or update via Internet:
- Hardware versions 1 – 3: the latest version only
- Hardware version 4: any version from 4.0 and up

WEB PAGE
Connect to instrument via Internet browser supporting JavaScript. The connection is password protected

Two Levels of Protection:
- Guest level: for viewing only
- Administrator level: for viewing and full control of the instrument

Software Specifications – Sound Level Meter Software for 2250 Light BZ-7130

Conforms with the following National and International Standards:
- IEC 61672–1 (2013) Class 1
- IEC 60651 (1979) plus Amendment 1 (1993– 02) and Amendment 2 (2000–10), Type 1
- IEC 60804 (2000–10), Type 1
- DIN 45657 (1997–07)
- ANSI S1.4–1983 plus ANSI S1.4 A–1985 Amendment, Type 1
- ANSI S1.43–1997, Type 1

Note: The International IEC Standards are adopted as European standards by CENELEC. When this happens, the letters IEC are replaced with EN and the number is retained. 2250 Light also conforms to these EN Standards

Input

CORRECTION FILTERS
For Microphone Types 4950, 4952+EH-2152, 4952 and 4184-A:
Correct the frequency response to compensate for sound field and accessories
Accessories (Type 4950 only): None or Windscreen UA-0237
Sound Field: Free-field or Diffuse-field (for Types 4952 and 4184-A only: 0° (Top) reference direction and 90° (Side) reference direction)

Analysis

DETECTORS
Parallel Detectors: On every measurement:
A- or B-weighted: (Switchable) broadband detector channel with three exponential time weightings (Fast, Slow, Impulse), one linearly averaging detector and one peak detector
C- or Z-weighted: (Switchable) as for A- or B-weighted
Overload Detector: Monitors the overload outputs of all the frequency weighted channels

MEASUREMENTS
X = frequency weightings A or B
Y = frequency weightings C or Z
V = frequency weightings A, B, C or Z
U = time weightings F or S
Q = exchange rate 4, 5 or 6 dB
N = number between 0.1 and 99.9
For Storage: Full statistics
For Display and Storage:

Start Time	Stop Time	Overload %
Elapsed Time	L_{Xeq}	L_{Yeq}
L_{XE}	L_{YE}	$L_{Ceq}–L_{Aeq}$
L_{XSmax}	L_{XFmax}	L_{XImax}
L_{YSmax}	L_{YFmax}	L_{YImax}
L_{XSmin}	L_{XFmin}	L_{XImin}
L_{YSmin}	L_{YFmin}	L_{YImin}
L_{XIeq}	L_{YIeq}	$L_{AIeq}–L_{Aeq}$
L_{AFTeq}	$L_{AFTeq}–L_{Aeq}$	Time Remaining
$L_{ep,d}$	$L_{ep,d,v}$	E
Dose%	Proj. Dose%	#VPeaks (>NNNdB)
#VPeaks (>137dB)	#VPeaks (>135dB)	L_{Vpeak}
T_{Vpeak}	L_{avUQ}	TWA
TWA_V	DoseUQ%	Proj. DoseUQ%
$L_{Aeq,T1,mov,max}$	$L_{Aeq,T2,mov,max}$	$L_{Ceq,T1,mov,max}$
$L_{Ceq,T2,mov,max}$	$\Delta L_{eq,T1,mov,max}$	$\Delta L_{eq,T2,mov,max}$

Weather Data (requires connection to a weather station):
Wind Dir. avg.
Wind Dir. min.
Wind Dir. max.
Wind Speed avg.
Wind Speed min.
Wind Speed max.
Amb. Temperature
Amb. Humidity
Amb. Pressure
Rainfall
Only for Display as Numbers or Quasi-analog Bars

L_{XS}	L_{XF}	L_{XI}
L_{YS}	L_{YF}	L_{YI}
$L_{XS(SPL)}$	$L_{XF(SPL)}$	$L_{XI(SPL)}$
$L_{YS(SPL)}$	$L_{YF(SPL)}$	$L_{YI(SPL)}$
$L_{Vpeak,1s}$	L_{AN1} or L_{AUN1}	L_{AN2} or L_{AUN2}
L_{AN3} or L_{AUN3}	L_{AN4} or L_{AUN4}	L_{AN5} or L_{AUN5}
L_{AN6} or L_{AUN6}	L_{AN7} or L_{AUN7}	Std.Dev.
$L_{Aeq,T1,mov}$	$L_{Aeq,T2,mov}$	$L_{Ceq,T1,mov}$
$L_{Ceq,T2,mov}$	$\Delta L_{eq,T1,mov}$	$\Delta L_{eq,T2,mov}$

Instantaneous Weather Data:
Wind Dir.
Wind Speed
Instantaneous GPS Data:
Latitude
Longitude

MEASURING RANGES
When using Microphone Type 4950
Dynamic Range: From typical noise floor to max. level for a 1 kHz pure tone signal, A-weighted: 16.4 to 140 dB
Primary Indicator Range: In accordance with IEC 60651: A-weighted: 23.6 dB to 122.3 dB
Linearity Range: In accordance with IEC 60804: A-weighted: 21.5dB to 140.8dB
Linear Operating Range: In accordance with IEC 61672:
- A-weighted 1 kHz: 24.9 dB to 139.8 dB
- C-weighted: 26.2 dB to 139.8 dB
- Z-weighted: 31.6 dB to 139.8 dB

Peak C Range: In accordance with IEC 61672: 1 kHz, 43.0 dB to 142.8 dB

SAMPLING FOR BROADBAND STATISTICS
Statistics can be based on either L_{AF}, L_{AS} or L_{Aeq}:
- Statistics $L_{AFN1–7}$ or L_{ASN1-7} are based on sampling L_{AF} or L_{AS}, resp., every 10 ms into 0.2 dB wide classes over 130 dB
- Statistics $L_{AN1–7}$ are based on sampling L_{Aeq} every second into 0.2 dB wide classes over 130 dB

Full distribution saved with measurement
The Std.Dev. (Standard Deviation) parameter is calculated from the Statistics

Measurement Display and Control

MEASUREMENT DISPLAYS
Measurement data displayed as numbers of various sizes and one quasi-analog bar.
Measured data are displayed as dB values, housekeeping data as numbers in relevant format.
Instantaneous measurement L_{XF} is displayed as a quasi-analog bar

MEASUREMENT CONTROL
Manual: Manually controlled single measurement
Automatic: Pre-set measurement time from 1 s to 24 hr in 1 s steps
Manual Controls: Reset, Start, Pause, Back-erase, Continue and Store the measurement manually

BACK-ERASE
The last 5 s of data can be erased without resetting the measurement

PREFERENCES
Date, Time and Number formats can be specified

Measurement Status

ON SCREEN
Information such as overload and running/paused are displayed on screen as icons

TRAFFIC LIGHTS
Red, yellow and green LEDs show measurement status and instantaneous overload as follows:
- Yellow LED flash every 5 s = stopped, ready to measure
- Green LED flashing slowly = awaiting calibration signal
- Green LED on constantly = measuring
- Yellow LED flashing slowly = paused, measurement not stored
- Red LED flashing quickly = intermittent overload, calibration failed

NOTIFICATIONS
Sends an SMS or email daily at a specified time or if an alarm condition is fulfilled.
Alarm Conditions:
- Disk space below set value
- Internal battery enters set state
- Change in measurement state
- Reboot of instrument

Calibration

Initial calibration is stored for comparison with later calibrations

ACOUSTIC
Using Sound Calibrator Type 4231 or custom calibrator. The calibration process automatically detects the calibration level when Sound Calibrator Type 4231 is used

ELECTRICAL
Uses internally generated electrical signal combined with a typed-in value of microphone sensitivity

CALIBRATION HISTORY
Up to 20 of the last calibrations made are listed and can be viewed on the instrument

Signal Monitoring

The input signal can be monitored using an earphone/headphones connected to the headphone socket

HEADPHONE SIGNAL
Input signal can be monitored using this socket with headphones/earphones
Gain Adjustment: –60 dB to 60 dB

GPS Annotations

A text annotation with GPS information can be attached (Latitude, Longitude, Altitude and position error). Requires connection to a GPS receiver

Data Management

PROJECT TEMPLATE
Defines the display and measurement settings. Setups can be locked and password protected

PROJECT
Measurement data stored with the project template

JOB
Projects are organised in jobs
Explorer facilities for easy management of data (copy, cut, paste, delete, rename, open project, create job, set default project name)

Software Specifications – 1/1-octave Frequency Analysis Software for 2250 Light BZ-7131 and 1/3-octave Frequency Analysis Software for 2250 Light BZ-7132

The specifications for BZ-7131 and BZ-7132 include the specifications for Sound Level Meter Software for 2250 Light BZ-7130. **BZ-7131 and BZ-7132 add:**

Standards

Conforms with the following National and International Standards:

- IEC 61260 (1995−07) plus Amendment 1 (2001−09), 1/1-octave Bands and 1/3-octave Bands, Class 0
- ANSI S1.11−1986, 1/1-octave Bands and 1/3-octave Bands, Order 3, Type 0−C
- ANSI S1.11− 2004, 1/1-octave Bands and 1/3-octave Bands, Class 0

Frequency Analysis

CENTRE FREQUENCIES
1/1-octave Band Centre Frequencies (BZ-7131 only):
16 Hz to 8 kHz
1/3-octave Band Centre Frequencies (BZ-7132 only):
12.5 Hz to 16 kHz

MEASUREMENTS
X = frequency weightings A, B, C or Z
Spectra for Display and Storage:
L_{Xeq} L_{XSmax} L_{XFmax}
L_{XSmin} L_{XFmin}
Spectra for Display Only:
L_{XS} L_{XF}

Single Values

SIL	PSIL	SIL3
$L_{Xeq}(f1–f2)^*$		
NR	NR Decisive Band	
RC	RC Classification	
NCB	NCB Classification	
NC	NC Decisive Band	
Loudness	Loudness Level (BZ-7132 only)	

*. where f1 and f2 are frequency bands in the spectrum.

MEASURING RANGES
When using Microphone Type 4950:
BZ-7131, 1/1-octave:

- Dynamic Range: From typical noise floor to max. level for a pure tone signal at 1 kHz: 5.9 to 140 dB
- Linear Operating Range: In accordance with IEC 61260: ≤22.9 dB to 140 dB

BZ-7132, 1/3-octave:

- Dynamic Range: From typical noise floor to max. level for a pure tone signal at 1 kHz: 1.0 to 140 dB
- Linear Operating Range: In accordance with IEC 61260: ≤20.1 dB to 140 dB

MEASUREMENT DISPLAYS
Spectrum: One or two spectra superimposed + A/B and C/Z broadband bars
Table: One or two spectra in tabular form
Y-axis: Range: 5, 10, 20, 40, 60, 80, 100, 120, 140 or 160 dB. Auto zoom or auto scale available
Cursor: Readout of selected band

Software Specifications – Logging Software for 2250 Light BZ-7133

The specifications for BZ-7133 include the specifications for Sound Level Meter Software for 2250 Light BZ-7130. **BZ-7133 adds:**

Logging

MEASUREMENTS
Measurement data logged at pre-set periods into files on:
- SD Card: All hardware versions
- CF Card: Hardware versions 1 – 3
- USB Memory Stick: Hardware version 4

Logging Period: From 1 s to 24 hr with 1 s resolution
Fast Logging: L_{AF} and L_{Aeq} can be logged every 100 ms, irrespective of logging period
Broadband Data Stored at each Logging Interval: All, or up to 10 selectable broadband data including weather data and $L_{Aeq,T,mov}$
Broadband Statistics Stored at each Logging Interval: Full distribution, or none
Spectrum Data Stored at each Logging Interval: All, or up to three selectable spectra (license for BZ-7131 or BZ-7132 required)
Logging Time: From 1 s to 31 days with 1 s resolution
Measurement Total: For the logging time, in parallel with logging: All broadband data, statistics and spectra (license for BZ-7131 or BZ-7132 required)
Automatic reboot and resume of operation in case of power failure

MEASUREMENT DISPLAYS
Profile: Graphical display of selectable measurement data versus time. Fast display of next or previous marker; Profile overview of entire measurement
Y-axis: Range: 5, 10, 20, 40, 60, 80, 100, 120, 140 or 160 dB. Auto zoom or auto scale available
X-axis: Scroll facilities
Cursor: Readout of measurement data at selected time

MARKERS
Five user-definable markers for on-line marking of noise sources or events anywhere in the profile. Markers are set using the stylus on the touch screen, or the three marker pushbuttons

Calibration

CHARGE INJECTION CALIBRATION (CIC)
Injects an internally generated electrical signal in parallel with the microphone diaphragm. A manual CIC can be performed whenever there is no measurement in progress
An automatic CIC can be performed at the start and end of a logging measurement

Storage

Measurement data is stored on an external memory device.
For availability, please refer to the Ordering Information

Notifications

ALARM CONDITIONS
CIC failed (in addition to those specified for BZ-7130)

Software Specifications – Signal Recording Option BZ-7226

Signal Recording Option BZ-7226 is enabled with a separate license. It works with all the software for Type 2250-L: Sound Level Meter, Frequency Analysis and Logging Software
For data storage, Signal Recording requires:
- SD Card: All hardware versions
- CF Card: Hardware versions 1 – 3
- USB Memory Stick: Hardware version 4

RECORDED SIGNAL
A-, B-, C- or Z-weighted signal from the measurement transducer

AUTOMATIC GAIN CONTROL
The average level of the signal is kept within a 40 dB range, or the gain can be fixed

SAMPLING RATE AND PRE-RECORDING
The signal is buffered for the pre-recording of the signal. This allows the beginning of events to be recorded even if they are only detected later.

Sampling Rate (kHz)	Maximum Pre-recording (s) 16-bit		Maximum Pre-recording (s) 24-bit		Memory (KB/s) 16-bit	Memory (KB/s) 24-bit
	HW 1 – 3	HW G4	HW 1 – 3	HW G4		
8	100	470	70	310	16	24
16	50	230	30	150	32	48
24	30	150	16	96	48	72
48	10	70	3	43	96	144

PLAYBACK (with Hardware Version 4 only)
Playback of signal recordings can be listened to using the earphone/headphones connected to the headphone socket

RECORDING FORMAT
The recording format is either 24-bit or 16-bit wave files (extension .wav) attached to the data in the project, easily played-back afterwards on a PC using BZ-5503, Type 7820 or 7825. Calibration information is stored in the wav file, allowing PULSE to analyse the recordings

Functions with BZ-7130 and BZ-7131

Manual Control of Recording: Recording can be manually started and stopped during a measurement using a pushbutton or an external signal
Automatic Control of Recording: Start of recording when measurement is started. Minimum and Maximum recording time can be preset

Functions with BZ-7133

Manual Control of Recording (using Manual Event or Back-erase pushbutton, or an external signal): Recording during all of the event, or for preset minimum and maximum duration. A Sound marker is set while recording. Selectable pre- and post-recording time
Manual Control of Recording (using touch screen): Recording for the selected time period (subject to the limitations of the pre-recording buffer). A Sound marker is set for the selected time period
Automatic Control of Recording: Recording during all of the event or for preset minimum and maximum duration. Selectable pre- and post-recording time
Playback: Playback of signal recordings can be listened to using earphone/headphones connected to the headphone socket
Gain Adjustment: –60 dB to 60 dB

Software Specifications – Tone Assessment Option BZ-7231

LICENSE
Tone Assessment Option BZ-7231 is enabled with a separate license and can be used with the 1/3-octave and logging template (BZ-7132 and BZ-7133)

TONE ASSESSMENT
Tone assessment is based on the measured 1/3-octave spectrum in accordance with either the international 'ISO 1996:2007 Acoustics – Description, assessment and measurement of environmental noise – part 2: Determination of environmental noise levels. Annex D (informative) Objective method for assessing the audibility of tones in noise – Simplified method'

SPECTRA ASSESSED
The displayed 1/3-octave spectrum (L_{eq}) may be assessed. Assessment is made as post-processing, that is, when measurement is paused or stopped

SETUP ACCORDING TO STANDARD
Setups in violation of the standard are indicated as such on the display. You can then accept to apply the default setup. Tone assessment will be made if possible, in spite of standard violations. For tone assessment according to ISO 1996-2, Annex D, you can set the division between the Low and Middle frequency range, the division between the Middle and High frequency range, and the limits for the level differences between adjacent bands

RESULTS
Tones are indicated above the spectrum when Tone is selected as spectrum parameter. The resulting adjustment can be viewed on the Value panel. It is not saved with the measurement

QUALITY INDICATORS
On the display, a quality indicator (smiley) will indicate that a hint is available for tone assessment quality. Click on the indicator to see the hint

Software Specifications – Measurement Partner Suite BZ-5503

BZ-5503 is included with 2250 Light for easy synchronisation of data between PC and 2250 Light. BZ-5503 is supplied on DVD BZ-5298

ON-LINE DISPLAY OF 2250 LIGHT DATA
Measurements on 2250 Light can be controlled from the PC and displayed on-line with the PC, using the same user interface on the PC as on 2250 Light

DATA MANAGEMENT
Explorer: Facilities for easy management of Instruments, Jobs and Projects (copy, cut, paste, delete, rename, create)
Synchronisation: Projects can be synchronised between PC and 2250 Light

EXPORT FACILITIES
Excel: Projects (or user-specified parts) can be exported to Microsoft® Excel®
Brüel & Kjær Software: Projects can be exported to Predictor-LimA Type 7810, Acoustic Determinator Type 7816, Evaluator Type 7820, Protector Type 7825 or Qualifier (Light) Type 7830 (7831)

POST-PROCESSING
Measurement Partner Suite is a suite of modules, including post-processing tools for data acquired with Type 2250-L. The following post-processing modules are available:
- Logging Post-processing Tools BZ-5503-A
- Spectrum Post-processing Tools BZ-5503-B

These two modules help to assess logging data and measured spectra, such as calculating contribution from markers on a logging profile or correcting spectra for background noise. For more information see the Product Data for Measurement Partner Suite, BP 2430

2250 LIGHT SOFTWARE UPGRADES AND LICENSES
The utility software controls 2250 Light software upgrades and licensing of the 2250 Light applications

INTERFACE TO 2250 LIGHT
USB, LAN or Internet connection
USB Connection:
- Hardware versions 1 – 3: USB ver. 1.1
- Hardware version 4: USB ver. 2.0

LANGUAGE
User Interface in Chinese (People's Republic of China), Chinese (Taiwan), Croatian, Czech, Danish, English, Flemish, French, German, Hungarian, Japanese, Italian, Korean, Polish, Portuguese, Romanian, Russian, Serbian, Slovenian, Spanish, Swedish and Turkish

HELP
Concise context-sensitive help in English

PC REQUIREMENT
Operating System: Windows® 7 or XP (both in 32-bit or 64-bit versions)
Recommended PC:
- Intel® Core™ 2 Duo
- Microsoft®.NET 4.0
- 2 GB of memory
- Sound card
- DVD drive
- At least one available USB port

Ordering Information

Type 2250-L-D10	Hand-held Analyzer with Sound Level Meter Software BZ-7130
Type 2250-L-D20	Hand-held Analyzer with Sound Level Meter Software BZ-7130 and 1/1-octave Frequency Analysis Software BZ-7131
Type 2250-L-D30	Hand-held Analyzer with Sound Level Meter Software BZ-7130 and 1/3-octave Frequency Analysis Software BZ-7132
Type 2250-L-D40	Hand-held Analyzer with Sound Level Meter Software BZ-7130 and Logging Software BZ-7133
Type 2250-L-D50	Hand-held Analyzer with Sound Level Meter Software BZ-7130, 1/1-octave Frequency Analysis Software BZ-7131, 1/3-octave Frequency Analysis Software BZ-7132 and Logging Software BZ-7133

Included with Type 2250-L:

- Type 4950: Prepolarized Free-field 1/2″ Microphone
- ZC-0032: Microphone Preamplifier
- AO-1494: USB Standard A to USB Micro B Interface Cable for hardware version 4, 1.8 m (6 ft)
- AO-1476: USB Standard A to USB Mini B Interface Cable for hardware versions 1 – 3, 1.8 m (6 ft)
- BZ-5298: Environmental Software DVD, including Measurement Partner Suite BZ-5503
- ZG-0426: Mains Power Supply
- QB-0061: Battery Pack
- FB-0691: Hinged Cover for Hand-held Analyzer
- UA-0237: 90 mm dia. Windscreen
- DH-0696: Wrist Strap
- KE-0441: Protective Cover for 2250 Light
- UA-1654: 5 Extra Styli

Software and Accessories Available Separately

SOFTWARE MODULES

BZ-7131	1/1-octave Frequency Analysis Software for 2250 Light
BZ-7132	1/3-octave Frequency Analysis Software for 2250 Light
BZ-7133	Logging Software for 2250 Light
BZ-7226	Signal Recording Option
BZ-7231	Tone Assessment Option

ANALYZER COMPONENTS

ZG-0444	Charger for QB-0061 Battery Pack

CALIBRATION

Type 4231	Sound Calibrator (fits in KE-0440)

MEASURING

Type 3535-A	All-weather Case (see Product Data BP 2251)
AO-0697-D-030	Microphone Extension Cable, 10-pin LEMO, 3 m (10 ft)
AO-0697-D-100	Microphone Extension Cable, 10-pin LEMO, 10 m (33 ft)
KE-0440	Travel Bag
HT-0015	Earphones
UA-0254	90 mm dia. Windscreens (6-pack of UA-0237)
UA-0587	Tripod
UA-0801	Small Tripod
UA-1317	Microphone Holder
UA-1651	Tripod Extension for Hand-held Analyzer
UL-1009	SD Memory Card for Hand-held Analyzers
UL-1013	CF Memory Card for Hand-held Analyzers (for hardware versions 1 – 3)
UL-1017	SDHC Memory Card for Hand-held Analyzers
UA-1673	Adaptor for Standard Tripod Mount
UA-1251	Lightweight Tripod
UA-1654	5 Extra Styli

INTERFACING

BZ-5503-A	Logging Module (see Product Data BP 2430)
BZ-5503-B	Spectrum Module (see Product Data BP 2430)
Type 7821	Evaluator™ Light – data viewing and calculation software
Type 7825	Protector™ – calculation software of personal noise exposure
UL-1016	10/100 Ethernet CF Card (for hardware versions 1 – 3)
UL-1019	CF WLAN Card for Hand-held Analyzers (for hardware versions 1 – 3)
UL-0250	USB to RS–232 Converter, for hardware version 4
UL-1025	SD WLAN Card for Hand-held Analyzers for hardware version 4

Service Products

MAINTENANCE

2250-L-EW 1	Extended Warranty, one year extension
2250-L-MU 1	Upgrade of 2250 Light to Type 2250, performed at headquarters
2250-L-UPG	Upgrade of software applications to latest version

ACCREDITED CALIBRATION

2250-CAI	Accredited Initial Calibration of Type 2250
2250-CAF	Accredited Calibration of Type 2250
2250-CTF	Traceable Calibration of Type 2250
2250-TCF	Conformance Test of Type 2250, with certificate

Compliance with Standards

CE	CE-mark indicates compliance with the EMC Directive and Low Voltage Directive. C-Tick mark indicates compliance with the EMC requirements of Australia and New Zealand.
Safety	EN/IEC 61010 – 1 and ANSI/UL 61010–1: Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1: General requirements
EMC Emission	EN/IEC 61000–6–3: Generic emission standard for residential, commercial and light industrial environments. CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits. FCC Rules, Part 15: Complies with the limits for a Class B digital device. IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards This ISM device complies with Canadian ICES-001 (interference causing equipment standard)
EMC Immunity	EN/IEC 61000–6–2: Generic standard – Immunity for industrial environments. EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements. IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards

Appendix A

Setup Parameters

This appendix describes all the setup parameters included in a template.

A.1 Input

Table A.1 *Input parameter*

Parameter	Values	Comment
Sound Field Correction	*Free-field* *Diffuse-field*	Select a correction matching the sound field of your measurements. that is, you can make correct measurements in a diffuse-field using a Type 4950 free-field microphone, by selecting *Diffuse-field* correction. Even free-field correction of a free-field microphone will enhance the overall frequency response of the system. Generally, ISO requires free-field conditions and ANSI requires diffuse-field conditions. Check your local standards for the setting you require. No correction is made for unknown transducers
Loudness	*Free-field* *Diffuse-field* *Auto*	Determines whether Loudness and Loudness Level are calculated based on Free-field or Diffuse-field conditions. Set to *Auto* to follow the setting of Sound Field Correction. For an unknown microphone type, you can set Loudness to the condition matching your request.

For outdoor measurements, it is often necessary to mount a windscreen on the microphone to reduce the measured wind noise. This has, however, a small impact on the overall frequency response of the analyzer.

To compensate for this, use the built in windscreen correction.

Table A.2 *Windscreen correction parameter*

Parameter	Values	Comment
Windscreen Correction	*None* *UA-0237*	You can manually select a windscreen correction for Windscreen UA-0237. No correction is made for unknown microphones
Trigger Input	*None* *MATRON Handswitch* *Voltage Level*	This parameter should be set to match the equipment connected to the Trigger Input socket on the connector panel of the analyzer Set it to *None*, if not used. Set *Trigger Input* to *MATRON Handswitch* if the analyzer is being used in the MATRON system. This setting should also be used if you want to use the Handswitch ZH-0680 for manually triggering signal recordings Set *Trigger input* to *Voltage Level* if you want to control signal recording by a voltage level generated by external equipment. The Voltage Level should generate at least 2 V for On and less than 1 V for Off. The duration of the steady level should be at least 1 s, so it can be recognised by the analyzer

A.2 Frequency Settings

Table A.3 *Frequency Settings parameters*

Parameter	Values	Comment
Broadband (excl. Peak)	*AC* *AZ* *BC* *BZ*	All broadband parameters (except L_{peak}) are measured simultaneously with two different frequency weightings – select the weightings here
Broadband Peak	*X* *C* *Z*	One broadband peak parameter L_{peak} is measured, select the frequency weighting here. **Note:** X = frequency weighting A or B. 'A' requires that the *Broadband (excl. Peak)* parameter is set to *AC or AZ.* 'B' requires that the *Broadband (excl. Peak)* parameter is set to *BC or BZ*

Table A.3 *(Cont.) Frequency Settings parameters*

Parameter	Values	Comment
Spectrum[*]	*X* *C* *Z*	The frequency analysis (1/1-octave or 1/3-octave) will be frequency weighted in accordance with this parameter **Note:** X = frequency weighting A or B. 'A' requires that the *Broadband (excl. Peak)* parameter is set to *AC or AZ.* 'B' requires that the *Broadband (excl. Peak)* parameter is set to *BC or BZ*
Bandwidth[†]	*1/1-octave* *1/3-octave*	Bandwidth of frequency analysis
Bottom F. for Special L_{eq}[‡,**]	*12.5 Hz* to *Top Frequency*	1/1-octave: 16 Hz – 8 kHz 1/3-octave: 12.5 Hz – 16 kHz
Top Freq. for Special L_{eq}[‡,††]	*Bottom Frequency* to *20 kHz*	1/1-octave: 16 Hz – 8kHz 1/3-octave: 12.5 Hz – 16 kHz

*. Requires 1/1-octave or 1/3-octave Frequency Analysis Software BZ-7131 or BZ-7132 respectively
†. The Bandwidth parameter cannot be set in Type 2250-L – the setting is determined by the template.
‡. For BZ-7131, BZ-7132 and BZ-7133 only.
**. *Bottom F. for Special Leq* is f1 in the parameter LXeq(f1-f2)
††. *Top F. for Special Leq* is f2 in the parameter LXeq(f1-f2)

A.3 Statistics

Table A.4 *Statistics parameters*

Parameter	Values	Comment
Broadband Statistics based on	L_{Xeq} L_{XF} L_{XS}	The broadband statistics are based on sampling the broadband parameter L_{XF} or L_{XS} each 10 ms or L_{Xeq} each second. **Note:** X = frequency weighting A or B. 'A' requires that the *Broadband (excl. Peak)* parameter is set to *AC or AZ.* 'B' requires that the *Broadband (excl. Peak)* parameter is set to *BC or BZ*
Percentile N1	*0.1 to 99.9*	User-defined percentile level where the value of L_{XN1} is exceeded for N1% of the elapsed time
Percentile N2	*0.1 to 99.9*	User-defined percentile level where the value of L_{XN2} is exceeded for N2% of the elapsed time
Percentile N3	*0.1 to 99.9*	User-defined percentile level where the value of L_{XN3} is exceeded for N3% of the elapsed time
Percentile N4	*0.1 to 99.9*	User-defined percentile level where the value of L_{XN4} is exceeded for N4% of the elapsed time

Table A.4 *(Cont.) Statistics parameters*

Parameter	Values	Comment
Percentile N5	*0.1 to 99.9*	User-defined percentile level where the value of L_{XN5} is exceeded for N5% of the elapsed time
Percentile N6	*0.1 to 99.9*	User-defined percentile level where the value of L_{XN6} is exceeded for N6% of the elapsed time
Percentile N7	*0.1 to 99.9*	User-defined percentile level where the value of L_{XN7} is exceeded for N7% of the elapsed time

The percentile levels N1 to N7 can be changed after the measurement has been done.

A.4 Measurement Control

Table A.5 *Measurement control parameters*

Parameter	Values	Comment
Measurement Mode *	*Manual* *Automatic*	Determines whether the measurement is under *Manual* control (fully controlled by the **Reset** and **Start/Pause** pushbuttons), or *Automatic* control (start of measurement controlled by the **Reset** and **Start/Pause** pushbuttons, end of measurement automatically controlled by the instrument when preset time has elapsed)
Preset Time *	*00:00:01 to 24:00:00*	Fixes the duration of a measurement from start to automatic stop (in hours, minutes and seconds). Any pauses made during the measurement via the **Start/Pause** pushbutton are not counted in the preset time
Preset Logging Time †	*0.00:00:01 to 31.00:00:00*	Fixes the duration of a measurement from start to automatic stop (in days, hours, minutes and seconds)
Logging Period †	*00:00:01 to 24:00:00*	Sets the period of the logging (in hours, minutes and seconds)
Synchronize with Clock †	*Yes* *No*	Select *Yes* to synchronize the logging intervals with whole minutes or hours, for example, if Logging Period is set to 00:01:00 (1 minute) and you start the measurement at 8:12:33, then the first logging interval will be from 8:12:33 to 8:12:59 (27 seconds), the second will be from 8:13:00 to 8:13:59 (60 seconds), etc. Select *No* if you want every logging interval to be exactly the specified Logging Period

Table A.5 *(Cont.) Measurement control parameters*

Parameter	Values	Comment
T for LXeq,T,mov	*00:01:00* to *01:00:00*	Sets the averaging time T (in minutes) of the moving L_{Aeq} and moving L_{Ceq}. When the averaging time T has elapsed the $L_{Aeq,T,mov}$ and $L_{Ceq,T,mov}$ parameters will contain the L_{Aeq} and L_{Ceq} of the latest T minutes – updated every second. In addition, you also have $\Delta L_{eq,T,mov} = L_{Ceq,T,mov} - L_{Aeq,T,mov}$. The $L_{Xeq,T,mov}$ is not stored with the total data, but can be logged (BZ-7224 and BZ-7225). The $L_{Aeq,T,mov,max}$, $L_{Ceq,T,mov,max}$ and the difference between the C- and A-weighted values for the complete measurement period are stored. **Note:** There are two sets of these parameters, allowing two simultaneous moving averages: e.g., one with 15 min averaging time and one with 1 hour averaging time.
Charge Injection Calibration †	*On* *Off*	Set to *On* for making a CIC at the start and end of Logging. An Exclude marker is set on the profile and *Total* parameters are not updated during the CIC

*. For Sound Level Meter (BZ-7130) and 1/1-octave and 1/3-octave Frequency Analyzer (BZ-7131 and BZ-7132) templates only
†. For Logging (BZ-7133) templates only

A.5 Logged Broadband

Table A.6 *Logged broadband parameters**

Parameter	Values	Comment
Full Statistics	*Yes* *No*	Determines whether the full broadband statistics are logged or not
Broadband Parameters	*All* *Selected*	Determines whether all broadband parameters are logged or a selected part is logged (up to 10 parameters)

Table A.6 *(Cont.) Logged broadband parameters**

Parameter	Values	Comment
Parameter 1 to Parameter 10	L_{Xeq} L_{Yeq} L_{Ceq}–L_{Aeq} $L_{Aeq,T1,mov}$ $L_{Aeq,T2,mov}$ $L_{Ceq,T1,mov}$ $L_{Ceq,T2,mov}$ $\Delta L_{eq,T1,mov}$ $\Delta L_{eq,T2,mov}$ L_{XE} L_{YE} L_{Vpeak} L_{XFmax} L_{XSmax} L_{Xlmax} L_{YFmax} L_{YSmax} L_{Ylmax} L_{XFmin} L_{XSmin} L_{Xlmin} L_{YFmin} L_{YSmin} L_{Ylmin} L_{Xleq} L_{Yleq} L_{Aleq}-L_{Aeq} L_{AFTeq} L_{AFTeq}-L_{Aeq} L_{avUQ} *SIL* *PSIL* *SIL3* L_{Weq}*(f1-f2)* *Overload* *Wind Dir. avg.* *Wind Dir. min.* *Wind Dir. max.* *Wind Speed avg.* *Wind Speed min.* *Wind Speed max.* *Amb. Temperature* *Amb. Humidity* *Amb. Pressure* *Rainfall*	This parameter can be set if Broadband Parameters = *Selected* X = frequency weightings A or B (controlled by *Setup* > *Frequency Settings* > *Broadband (excl. Peak)* parameter) Y = frequency weightings C or Z (controlled by *Setup* > *Frequency Settings* > *Broadband (excl. Peak)* parameter) V = frequency weightings A, B, C or Z (controlled by *Setup* > *Frequency Settings* > *Broadband Peak* parameter) U = time weightings F or S (controlled by *Setup* > *Occupational Health* > *Time Weighting for Lav* parameter) Q = exchange rate 4, 5 or 6 dB (controlled by *Setup* > *Occupational Health* > *Exchange Rate for Lav* parameter) f1 = Bottom frequency band (controlled by *Setup* > *Frequency Settings* > *Bottom F. for Special Leq*) f2 = Top frequency band (controlled by *Setup* > *Frequency Settings* > *Top Freq. for Special Leq*)

*. For Logging (BZ-7133) templates only

A.6 Logged Broadband (100 ms)

Table A.7 *Logged broadband (100 ms) parameters*[*]

Parameter	Values	Comment
Parameter 1 to *Parameter 3*	L_{Aeq} L_{AF} L_{AS} *Off*	The selected parameter(s) will be logged every 100 ms. L_{Aeq} will have an averaging time of 100 ms.

*. For Logging (BZ-7133) templates only

A.7 Logged Spectrum

Table A.8 *Logged spectrum parameters*[*]

Parameter	Values	Comment
Spectrum Parameters	*All* *Selected* *None*	Determines whether all spectrum parameters are logged, a selected part of the parameters are logged (up to 3 parameters) or none are logged
Spectrum 1 to Spectrum 3	L_{Xeq} L_{XFmax} L_{XSmax} L_{XFmin} L_{XSmin} *Off*	These parameters can be set if *Spectrum Parameters* = *Selected*. X = frequency weightings A, B, C or Z (controlled by *Setup – Frequency Settings – Spectrum* parameter)

*. For Logging (BZ-7133) templates only, requires 1/1-octave or 1/3-octave Frequency Analysis Software BZ-7131 or BZ-7132 respectively

A.8 Markers

Table A.9 *Markers**

Parameter	Values	Comment
Marker 1	*Text string*	Default set to 'Exclude'. This marker can be set using the stylus in the profile or the **Back-erase** pushbutton during a measurement
Marker 2	*Text string*	Default set to 'Event 1'. This marker can be set using the stylus in the profile or the **Manual Event 1** pushbutton during a measurement
Marker 3	*Text string*	Default set to 'Event 2'. This marker can be set using the stylus in the profile, or the **Manual Event 2** pushbutton during a measurement
Marker 4 and Marker 5	*Text string*	These markers can be set using the stylus in the profile display
Marker 6	*Text string*	Default set to 'Sound'. This marker is set if a signal recording is made during a measurement
Pre-marker Time	*0 to 5 s*	Specifies number of seconds marker 1, marker 2 or marker 3 will be set ahead of the point where the **Back-erase** or the **Manual Event 1** or **2** pushbuttons are pressed

*. For Logging (BZ-7133) templates only

A.9 Signal Recording

Table A.10 *Signal Recording parameters*[*]

Parameter	Values	Comment
Recording Control	*Off* *Automatic* *Manual Event* *Exclude Event*[†] *External Event* *All Events*[†]	Determines how recording of the measured signal is controlled Set to *Automatic* to start the recording when the measurement is started and record throughout the measurement, only limited by the *Maximum Duration* Set to *Manual Event* to start recording manually while measuring when the **Manual Event** pushbutton is pressed, and record until pressing the pushbutton again, however, take *Maximum* and *Minimum Duration* into account Set to *Exclude Event* to start recording manually while measuring when the **Back-erase** pushbutton is pressed, and record until pressing the pushbutton again, however, take *Maximum* and *Minimum Duration* into account Set to *External Event* to start recording using external equipment connected to the Trigger Input Socket Set to *All Events* to record while any of the events above are active, however, take *Maximum* and *Minimum Duration* into account If you do not want to record the input signal, then set *Recording Control* to *Off*, to economise on power
Recording Quality	*Low* *Fair* *Medium* *High*	This setup determines the quality of the recording by adjusting the sampling rate. The amount of space required for the recording will depend on the selected quality and resolution: Quality / Sampling freq. / Upper freq. / Memory 16-bit / Memory 24-bit *Low* 8 kHz 3 kHz 16 KB/s 24 KB/s *Fair* 16 kHz 6 kHz 32 KB/s 48 KB/s *Medium* 24 kHz 10 kHz 48 KB/s 72 KB/s *High* 48 kHz 20 kHz 96 KB/s 144 KB/s
Recorded Signal [†]	*Input X-weighted* *Input C-weighted* *Input Z-weighted*	Use this parameter to select the frequency weighting of the recorded signal **Note 1:** The frequency weighting of the recorded signal can be selected independently of the frequency weighting of the measurement and the signal at the earphone socket **Note 2:** *X* = frequency weighting A or B. 'A' requires that the *Broadband (excl. Peak)* parameter is set to *AC or AZ.* 'B' requires that the *Broadband (excl. Peak)* parameter is set to *BC or BZ*

Table A.10 *(Cont.) Signal Recording parameters*[*]

Parameter	Values	Comment
Automatic Gain Control [†]	*On* *Off*	To ease identification of sound sources by listening, the gain can be automatically adjusted to keep the average level within a 40 dB range. When playing back the recorded signal, you will then hear clearly the whole signal content, whether the level has been 20 dB or 140 dB. Set *Automatic Gain Control* to *On* to convert the recorded signal. The recorded signal is stored as a 16 bit wav-file. Set *Automatic Gain Control* to *Off* for recording the signal with a fixed gain – then set *Resolution = 24 bit* (recommended) to cover the full 120 dB dynamic range (from max. input level and down) or select *Resolution = 16 bit* and specify the *Peak Recording Level* to fit the signal. **Note:** If the sound contains very high levels at low frequency, then a fixed gain is recommended
Resolution	*24 bit/16 bit*	Set *Resolution* to *24 bit* to cover the full dynamic range. Set *Resolution* to *16 bit* to cover up to 96 dB from *Peak Recording Level* and down. **Note:** You will only be warned about overload in the recorded signal if *Automatic Gain Control* is *On* or if *Resolution* is *24 bit* or if *Peak Recording Level* is set to its maximum value.
Peak Recording Level	*145 dB* *135 dB* *125 dB* *115 dB* *105 dB* *95 dB* *85 dB* *75 dB*	For *Automatic Gain Control = Off* and *Resolution = 16 bit* the recorded wave file has a dynamic range of up to 96 dB. When playing back on the analyzer, the dynamic range of the output is approx. 75 dB. When playing back on a PC it might be even lower. Set *Peak Recording Level* to fit the signal. The values for *Peak Recording Level* take the sensitivity of the attached transducer into account. The values shown in the list here are nominal values for a Type 4189 or 4190 microphone. **Hint:** Monitor the L_{peak} value during a trial measurement before selecting the *Peak Recording Level*
Pre-recording Time [†]	*0* to *470 s*	Recording is started the *Pre-recording Time* before the trigger conditions are fulfilled (for example, 5 s means the recording will be started 5 s before you hit the **Manual Event** pushbutton). This is possible because the recording is done continuously in an internal buffer, ready to be saved as a wave file. The *Pre-recording Time* is limited by this buffer size and the *Recording Quality* and *Resolution*: Quality / Pre-recording Time limit 16-bit (HW 1 – 3 / HW 4) / Pre-recording Time Limit 24-bit (HW 1 – 3 / HW 4) *Low*: 110 s / 470 s / 70 s / 310 s *Fair*: 50 s / 230 s / 30 s / 150 s *Medium*: 30 s / 150 s / 16 s / 96 s *High*: 10 s / 70 s / 3 s / 43 s

Table A.10 *(Cont.) Signal Recording parameters**

Parameter	Values	Comment
Post-recording Time †	*0* to *300 s*	Use this parameter to specify how much extra you want to be recorded after the trigger conditions are no longer fulfilled
Duration Limit †	*On* *Off*	Use this parameter to enable the *Minimum Duration* and *Maximum Duration* parameters for overruling the duration of the signal recording determined by the trigger condition parameters
Minimum Duration †	*00:00:00* to *01:00:00*	When *Duration Limit* is *On*, then *Minimum Duration* will determine the minimum recording time regardless of the trigger conditions The total record length will then (as a minimum) be the sum of *Minimum Duration*, *Pre-recording Time* and *Post-recording Time*
Maximum Duration †	*00:00:00* to *01:00:00*	When *Duration Limit* is *On*, then *Maximum Duration* will determine the maximum recording time regardless of the trigger conditions. The total record length will then (as a maximum) be the sum of *Maximum Duration*, *Pre-recording Time* and *Post-recording Time.* **Note:** If *Maximum Duration* = *00:00:00*, then it is disabled and does not limit the duration

*. Requires license for Signal Recording Option BZ-7226.
†. For Logging BZ-7133 template only.

A.10 Occupational Health

Table A.11 *Occupational health parameters*

Parameter	Values	Comment
Exposure Time	*00:01:00 to 1.00:00:00*	Set the *Exposure Time* to the actual time that you are exposed to noise during a workday. Used for calculation of $L_{ep,d}$ and $L_{ep,d,v}$. **Note:** *Exposure Time* can be changed after the measurement has been done
Reference Time	*00:01:00 to 5.00:00:00*	Set the *Reference Time* as required for calculation of Sound Exposure Level or Time Weighed Average with a reference time other than 8 hours. Used for calculation of $L_{ep,d,v}$ and TWA_v

Table A.11 *(Cont.) Occupational health parameters*

Parameter	Values	Comment
Threshold Level	*0 to 140 dB*	Any sound levels below the threshold value do not contribute to the Dose measurement data. The time resolution for this calculation is 1 s for calculation of Dose and ProjDose – and 10 ms for calculation of TWA, TWA_v, DoseUQ and ProjDoseUQ. Used for calculation of Dose, ProjDose, TWA, TWAv, DoseUQ, ProjDoseUQ. U = *Time Weighting for Lav*: F or S Q = *Exchange Rate for Lav*: 4, 5 or 6 dB
Criterion Level	*0 to 140 dB*	*Criterion Level* is the sound level allowed for an 8-hour period and would yield a 100% dose. The criterion level must be set according to the legislation with which you will have to comply. Used for calculation of Dose, ProjDose, DoseUQ, ProjDoseUQ. U = *Time Weighting for Lav*: F or S Q = *Exchange Rate for Lav*: 4, 5 or 6 dB

PeaksOver Level	*0 to 200 dB*	Any peak levels that exceed the level set here will be counted.
		Used for calculation of #XPeaks(>NNNdB)
		X = A, B, C or Z, set by **Setup** – *Input* – *Broadband Peak*, NNN is the *PeaksOver Level*
		Note: Two other peak counters are preset to count peaks over 135 dB and 137 dB, respectively

Exchange Rate for Lav	*4 dB* *5 dB* *6 dB*	The increase in noise level that corresponds to a doubling of the noise level is determined by *Exchange Rate for Lav*. Set *Exchange Rate for Lav* as required by your local standards. Used for calculation of LavUQ, TWA, TWA_v DoseUQ, ProjDoseUQ. U = *Time Weighting for Lav*: F or S Q = *Exchange Rate for Lav*: 4, 5 or 6 dB **Note:** TWA and TWA_v requires U = S and Q = 5
Time Weighting for Lav	*F* *S*	Lav will be time weighted in accordance with this parameter. Used for calculation of LavUQ, TWA, TWA_v DoseUQ, ProjDoseUQ. U = *Time Weighting for Lav*: F or S Q = *Exchange Rate for Lav*: 4, 5 or 6 dB **Note:** TWA and TWA_v requires U = S and Q = 5

A.11 Tone Assessment

Table A.12 *Tone Assessment Parameters*[*]

Parameter	Values	Comment
Tone Assessment	*On* *Off*	Set *Tone Assessment* to *On* to enable tone assessment functionality, then select the *Tone* parameter above the spectrum to display the results
Tone Standard	*ISO 1996:2-2007*	ISO 1996:2-2007, Annex D is the objective method for assessing the audibility of tones in noise – simplified method. This method uses 1/3-octave spectra
Adjustment	*0.0* to *20 dB*	This is the adjustment you should add to L_{Aeq} if audible tones are found in the spectrum. The resulting adjustment can be read below the spectrum
Low Freq. Last Band	*12.5 Hz* to *315 Hz*	Set the frequency for the last band of the low frequency range of the assessment. Default is 125 Hz The low frequency range is from the lowest measured frequency band to the value of the *Low Freq. Last Band* parameter
Middle Freq. Last Band	*160 Hz* to *20 kHz*	Set the frequency for the last band of the middle frequency range of the assessment. Default is 400 Hz The middle frequency range is from one band higher than the *Low Freq. Last Band* parameter to the value of the *Middle Freq. Last Band* parameter
Level Difference Low	*0.1* to *100.0 dB*	Set the required level difference for detecting a tone in the low frequency range. Default is 15 dB
Level Difference Middle	*0.1* to *100.0 dB*	Set the required level difference for detecting a tone in the middle frequency range. Default is 8 dB
Level Difference High	*0.1* to *100.0 dB*	Set the required level difference for detecting a tone in the high frequency range. Default is 5 dB

*. Requires Tone Assessment Option BZ-7231. Available for microphone input only.

Appendix B

Measurement Parameters

This appendix describes the measurement parameters. They are measured in accordance with the setup parameters.

Please refer to the Glossary in Appendix E for a description of the parameters.

The following letters are substituted in the parameters that follow to represent the wide range of frequency weightings, time weightings and percentile levels available:

V = frequency weightings A, B, C or Z (controlled by *Setup* > *Frequency Settings* > *Broadband Peak* parameter)

X = frequency weightings A or B (controlled by *Setup* > *Frequency Settings* > *Broadband (Excl. Peak*) parameter)

Y = frequency weightings C or Z (controlled by *Setup* > *Frequency Settings* > *Broadband (Excl. Peak*) parameter)

W = frequency weightings A, B, C or Z (controlled by *Setup* > *Frequency Settings* > *Spectrum* parameter)

U = time weightings F or S (controlled by *Setup* > *Statistics* > *Spectral Statistics Based On* parameter)

R = time weightings F or S (controlled by *Setup* > *Occupational Health* > *Time Weighting for LAV* parameter)

Q = exchange rate 4, 5 or 6 dB (controlled by *Setup* > *Occupational Health* > *Exchange Rate* parameter)

N = number between 0.1 and 99.9 (controlled by *Setup* > *Statistics* > *Percentile N* parameter)

B.1 Total Measurement

B.1.1 For BZ-7130, BZ-7131, BZ-7132 and BZ-7133 Software

The following parameters are measured within the Elapsed Time:

Equivalent Continuous Sound Levels

- L_{Xeq}
- L_{Yeq}
- L_{Ceq}-L_{Aeq}
- $L_{Aeq,T1,mov}$ (not saved with data)
- $L_{Aeq,T1,mov,max}$
- $L_{Aeq,T2,mov}$ (not saved with data)
- $L_{Aeq,T2,mov,max}$
- $L_{Ceq,T1,mov}$ (not saved with data)
- $L_{Ceq,T1,mov,max}$
- $L_{Ceq,T2,mov}$ (not saved with data)
- $L_{Ceq,T2,mov,max}$
- $\Delta L_{eq,T1,mov}$ (not saved with data)
- $\Delta L_{eq,T1,mov,max}$
- $\Delta L_{eq,T2,mov}$ (not saved with data)
- $\Delta L_{eq,T2,mov,max}$

Sound Exposure Level

- L_{XE}
- L_{YE}

Peak Sound Level

- L_{Vpeak}
- T_{Vpeak}

Maximum Time-weighted Sound Levels

- L_{XFmax}
- L_{XSmax}
- L_{XImax}
- L_{YFmax}
- L_{YSmax}
- L_{YImax}

Minimum Time-weighted Sound Levels

- L_{XFmin}
- L_{XSmin}
- L_{XImin}
- L_{YFmin}
- L_{YSmin}
- L_{YImin}

ISO/EU Occupational Health Parameters

- *E*
- *Dose*
- *ProjDose*
- *#VPeaks (>xxx dB)*
- *#VPeaks (>137 dB)*
- *#VPeaks (>135 dB)*

US Occupational Health Parameters

- L_{avRQ}
- *TWA*
- TWA_v
- *DoseRQ*
- *ProjDoseRQ*

General Parameters

- *Overload* in %
- *Start time*
- *Stop Time*
- *Elapsed Time* (excl. pauses)

Special Parameters

- L_{XIeq} (also called L_{XIm})
- L_{YIeq}
- L_{AIeq}-L_{Aeq}
- L_{AFTeq} (also called L_{AFTm5})
- L_{AFTeq}-L_{Aeq}
- *SIL* (average of L_{Zeq} octave band levels: 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz)*
- *PSIL* (average of L_{Zeq} octave band levels: 500 Hz, 1000 Hz and 2000 Hz)*
- *SIL3* (average of L_{Zeq} octave band levels: 1000 Hz, 2000 Hz and 4000 Hz)*
- L_{Weq}*(f1-f2)* (sum of power values for L_{Weq} frequency bands from f1 Hz to f2 Hz)*

*. These parameters require a license for either BZ-7131 or BZ-7132, and measurement of spectra.

Statistics to Calculate Percentile Levels and Std.Dev.

Weather Data (requires connection to a weather station)

- *Wind Dir. avg.*
- *Wind Dir. min.*
- *Wind Dir. max.*
- *Wind Speed avg.*
- *Wind Speed min.*
- *Wind Speed max.*
- *Amb. Temperature*
- *Amb. Humidity*
- *Amb. Pressure*
- *Rainfall*

Spectrum Parameters†

- L_{Weq}
- L_{WFmax}
- L_{WSmax}
- L_{WFmin}
- L_{WSmin}

Statistics to Calculate Percentile Levels as Spectra*

CIC Results

- *CIC 1 Result*‡
- *CIC 1 Dev. from Reference*†
- *CIC 2 Result*†
- *CIC 2 Dev. from Reference*†

In addition to the parameters saved within the data (listed above), the following can be inserted in a project annotation as a GPS Note:

- *Position* as Latitude and Longitude
- *Altitude*
- *Position error* (dependant on type of GPS unit)

†. These parameters require a license for either BZ-7131 or BZ-7132, and measurement of spectra.
‡. These parameters are available for Logging BZ-7224 only.

B.2 Logged Measurement

B.2.1 For Logging Software for 2250 Light BZ-7133

Parameters measured within a logging interval – up to ten (or all) of the following parameters can be logged:

Equivalent Continuous Sound Levels

- L_{Xeq}
- L_{Yeq}
- L_{Ceq}-L_{Aeq}
- $L_{Aeq,T1,mov}$
- $L_{Aeq,T2,mov}$
- $L_{Ceq,T1,mov}$
- $L_{Ceq,T2,mov}$
- $\Delta L_{eq,T,mov}$
- $\Delta L_{eq,T,mov}$

Sound Exposure Level

- L_{XE}
- L_{YE}

Peak Sound Level

- L_{Vpeak}

Maximum Time-weighted Sound Levels

- L_{XFmax}
- L_{XSmax}
- L_{XImax}
- L_{YFmax}
- L_{YSmax}
- L_{YImax}

Minimum Time-weighted Sound Levels

- L_{XFmin}
- L_{XSmin}
- L_{XImin}
- L_{YFmin}
- L_{YSmin}
- L_{YImin}

US Occupational Health Parameters

- L_{avRQ}

Special Parameters

- L_{XIeq} (also called L_{XIm})
- L_{YIeq}
- L_{AIeq}-L_{Aeq}
- L_{AFTeq} (also called L_{AFTm5})
- L_{AFTeq}-L_{Aeq}
- *SIL* (average of L_{Zeq} octave band levels: 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz)**
- *PSIL* (average of L_{Zeq} octave band levels: 500 Hz, 1000 Hz and 2000 Hz)*
- *SIL3* (average of L_{Zeq} octave band levels: 1000 Hz, 2000 Hz and 4000 Hz)*
- L_{Weq}*(f1-f2)* (sum of power values for L_{Weq} frequency bands from f1 Hz to f2 Hz)*

The following parameters are available per set of logged parameters

- *Overload* in %
- *Start time*
- *Stop Time*
- *Elapsed Time* (excl. pauses)

The Statistics can be logged to calculate Percentile Levels and Std.Dev. per logging interval

Weather Data (requires connection to a weather station)

- *Wind Dir. avg.*
- *Wind Dir. min.*
- *Wind Dir. max.*
- *Wind Speed avg.*
- *Wind Speed min.*
- *Wind Speed max.*
- *Amb. Temperature*
- *Amb. Humidity*
- *Amb. Pressure*
- *Rainfall*

Up to three (or all) of the following Spectrum parameters can be logged and displayed on the spectrum display††

- L_{Weq}
- L_{WFmax}
- L_{WSmax}
- L_{WFmin}
- L_{WSmin}

**. These parameters require a license for either BZ-7131 or BZ-7132, and measurement of spectra.
††. These parameters require a license for either BZ-7131 or BZ-7132, and measurement of spectra.

B.3 Logged (100 ms) Measurement

B.3.1 For Logging Software for 2250 Light BZ-7133

The following Broadband parameters can be logged every 100 ms

- L_{Aeq}
- L_{AF}
- L_{AS}

B.4 Instantaneous Measured Parameters (available at any time)

Instantaneous Time-weighted Sound Levels

- L_{XF}
- L_{XS}
- L_{XI}
- L_{YF}
- L_{YS}
- L_{YI}

Sound Pressure Levels (maximum time-weighted sound levels once per second)

- $L_{XF(SPL)}$
- $L_{XS(SPL)}$
- $L_{XI(SPL)}$
- $L_{YF(SPL)}$
- $L_{YS(SPL)}$
- $L_{YI(SPL)}$

Peak Sound Levels (maximum peak sound level once per second)

- $L_{Vpeak,1s}$

Instantaneous Weather Data

- *Wind Dir.*
- *Wind Speed*

Instantaneous GPS Data

- *Latitude*
- *Longitude*

Instantaneous Measured Spectra‡‡

- L_{WF}
- L_{WS}

B.4.1 Processed Parameters for Display Only

The following general parameter is available for display for Total data:

- *Time Remaining* (for the current measurement, taking available disk space into account)

The following ISO/EU Occupational Health Parameters are calculated and displayed for Total, Periodic Reports and Logged data:

- $L_{ep,d}$
- $L_{ep,d,v}$

If Statistics are available, then Std.Dev. and 7 percentile levels can be calculated and displayed: *LXN1* or *LXUN1* to *LXN7* or *LXUN7*.

If L_{Weq} spectrum is available, then NC, NC Decisive Band, NR, NR Decisive Band, RC, RC Classification, NCB, NCB Classification can be calculated and displayed.

If L_{Weq} 1/3-octave spectrum is available, then Loudness and Loudness Level can be calculated and displayed.

B.4.2 Relationship Between Setup and Measurement Parameters

The measurement parameters are measured in accordance with the setup parameters.

Table B.1 through Table B.3 describe the relationship between the setup and measurement parameters:

Table B.1 *General Parameters*

Parameter	LXeq	LXE	LXleq	LAFTeq	LVpeak	TVpeak	LXYmax	LXYmin
Sound Field Correction	•	•	•	•	•	•	•	•
Windscreen Correction	•	•	•	•	•	•	•	•
Broadband (excl. Peak)	•	•	•	A			•	•
Broadband Peak					•	•		

‡‡. These parameters require a license for BZ-7223 and measurement of spectra.

Table B.2 *Statistics*

Parameter	LXYN
Sound Field Correction	•
Windscreen Correction	•
Broadband (excl. Peak)	•
Broadband Statistics based on	•
Percentile N%	•

Table B.3 *Occupational Health Parameters*

Parameter	$L_{ep,d}$	$L_{ep,d,v}$	E	Dose	ProjDose	#VPeaks (>NNNdB)	LavRQ	TWA	TWA_v	Dose-RQ	Proj-DoseRQ
Sound Field Correction	•	•	•	•	•	•	•	•	•	•	•
Wind-screen Correction	•	•	•	•	•	•	•	•	•	•	•
Broadband (excl. Peak)	A	A	A	A	A		A	A	A	A	A
Broadband Peak						•					
Exposure Time	•	•									
Reference Time		•							•		
Threshold Level				•	•			•	•	•	•
Criterion Level				•	•					•	•
Peaks-Over Level						•					
Exchange Rate for Lav							•	5	5	•	•
Time Weighting for Lav							•	Σ	Σ	•	•

Appendix C

Instrument Parameters

This appendix describes the parameters for microphones and calibration.

C.1 Current Transducer

Table C.1 *Current transducer parameter*

Parameter	Values	Comment
Transducer (that is, connected to *Top Socket*)	Name and serial number of transducer	This parameter selects which transducer is connected to the *Top Socket* (displayed in **Setup** – *Input* and at the top of **Transducers** database)

C.2 Transducers

The Transducers setup consists of a setup and a calibration history.

C.2.1 Microphone Setup

Table C.2 *Microphone setup parameters*

Parameter	Values	Comment
Serial No.	Text string	Insert unique ID for microphone
Name	Text string	Insert name of microphone to display together with serial number
Description	Text string	Insert description of microphone
Preamplifier ID No.	Text string	Document the preamplifier here

Table C.2 *(Cont.) Microphone setup parameters*

Parameter	Values	Comment
Microphone Type	*4950* *4952 0°* *4952 90°* *4184-A 0°* *4184-A 90°* *EH-2152 0°* *EH-2152 90°* *Unknown*	If microphone is a known type, then the rest of the parameters of the transducer are set automatically. *Sound Field Correction* and *Windscreen Correction* are possible for known microphone types only. Microphone Types 4952 and 4184-A can be used with 0° reference direction or 90° reference direction. For unknown microphone types, set the rest of the parameters – no corrections can be made for unknown types **Note 1:** Type 4184-A is available for hardware version 4 only **Note 2:** You can specify up to 5 different microphones in the transducer database. For hardware versions 1 – 3 the number is limited to 3.
Nominal Sensitivity	Double	Set automatically for known *Microphone Type*, otherwise set the nominal sensitivity of the microphone in mV/Pa
Polarization Voltage	*Yes* *No*	Set to *No* if microphone is prepolarized, otherwise set to *Yes* for polarization voltage of 200 V. Set automatically for known *Microphone Type*. **Note:** This parameter is available for hardware version 4 only.
Free-field Type	*Yes* *No*	Set to *Yes* for Free-field types, otherwise set to *No*. Set automatically for known *Microphone Type*
Capacitance	Double	Insert capacitance of microphone in pF. Set automatically for known *Microphone Type*
Calibration Check	*CIC* *Actuator*	Microphone only: For microphone Type 4184-A you can select to check the calibration of the system using CIC or Actuator – for all other microphone types the setting is preset to CIC.

C.2.2 Calibration History

Table C.3 *Calibration history parameters*

Parameter	Values	Comment
1. Calibration date & Time	*YYYY-MM-DD hh:mm:ss*	Initial
1. *Sensitivity*	Double	Initial mV/Pa
1. *Preamplifier ID No.*	Text string	Initial
1. *User*	2250 Light	Initial
1. *Input*	*Top Socket*	Initial
1. *Calibration Type*	External, Internal, Check	Initial
1. *Calibrator Serial No.*	Text string	Initial
1. *Comment*	Text string	Initial
1. 2250 Serial No.	Text string	Initial
2. Calibration date & Time	*YYYY-MM-DD hh:mm:ss*	
2. *Sensitivity*	Double	
2. *Preamplifier ID No.*	Text string	
2. *User*	2250 Light	
2. *Input*	*Top Socket*	
2. *Calibration Type*	External, Internal, Check	
2. *Calibrator Serial No.*	Text string	
2. *Comment*	Text string	
2. 2250 Serial No.	Text string	
:	:	:
N. Calibration date & Time	*YYYY-MM-DD hh:mm:ss*	Current
N. *Sensitivity*	Double	Current
N. *Preamplifier ID No.*	Text string	Current
N. *User*	2250 Light	Current
N. *Input*	*Top Socket*	Current
N. *Calibration Type*	External, Internal, Check	Current
N. *Calibrator Serial No.*	Text string	Current
N. *Comment*	Text string	Current
N. 2250 Serial No.	Text string	Current

C.3 Calibration Setup

Table C.4 *Calibration setup parameters*

Parameter	Values	Comment
Calibrator	*4231* *Custom*	Select which calibrator to use
Calibration Level (for Sound Calibrator Type 4231)	*0.00* to *200.00 dB* re 20 µPa	The *Calibration Level* will be automatically calculated
Calibration Level (for Custom Sound Level Calibrator)	*0.00* to *200.00 dB* re 20 µPa	Set calibration level for custom calibrator
Serial No. for 4231	Text string	Serial number will be documented in calibration history
Serial No. for Custom Sound Level Calibrator	Text string	Serial number will be documented in calibration history

C.4 Type 2250 Light Microphones

Table C.5 *Microphone parameters*

Microphone	Application	Optimised For	Dynamic Range*	Free-field ±1 dB Frequency Range	Free-field ±2 dB Frequency Range
4950	Standard Prepolarized	Free-field and Diffuse-field	16.4 –140 dB(A)	6.3 Hz – 19.0 kHz	5.6 Hz – 20 kHz
4952	Outdoor Prepolarized	Free-field 0° or 90° and Diffuse-field	20.0 – 141 dB(A)	6.3 Hz – 14.0 kHz	5.6 Hz – 14.5 kHz
4952 + EH-2152	Outdoor Prepolarized	Free Field 0° or 90° Diffuse Field	20.0 – 141 dB(A)	6.3 Hz – 14.0 kHz	5.6 Hz – 14.5 kHz
4184-A†	Weatherproof 200 V	Free-field 0° or 90° and Diffuse-field	28.8 – 150 dB(A)	3.6 Hz – 15.0 kHz 6.6 Hz – 15.0 kHz	2.5 Hz – 16.5 kHz 5.6 Hz – 16.5 kHz

*. From the typical total inherent noise level for the microphone and Type 2250 Light, to the overload limit for a sinusoidal signal at 1 kHz.
†. Only with hardware version 4

Appendix D

Preferences

This appendix describes the parameters that are common to all project templates and can be set as preferences.

D.1 Display Settings

Table D.1 *Traffic light, backlight and decimal place parameters*

Parameter	Values	Comment
Traffic Light Brightness	*Off* *Low* *Normal* *High*	
Key Backlight	*Off* *On*	
Backlight Brightness	*Minimum* *Level 2* *Level 3* *Level 4* *Level 5* *Maximum*	Select backlight brightness using the backlight icon at the bottom of the screen. Maximum level uses the most power
Resolution of Readings	*Normal* *Extended*	*dB*: Number of decimal places for values displayed: *Normal, 1*; *Extended, 2* *Engineering*: Number of digits for values displayed: *Normal, 3*; *Extended, 4* **Note:** This setting is for display only and has no effect on the measurement precision or resolution

D.2 Power Settings

Table D.2 *Power settings parameters*

Parameter	Values	Comment
Backlight Dim	*After 30 sec.* *After 1 min.* *After 2 min.* *After 5 min.* *After 10 min* *Never*	Select optimum value for full backlight on (brightness determined by *Backlight Brightness*) before the backlight is dimmed (if analyzer is left untouched)
Turn off Backlight	*After 1 min.* *After 2 min.* *After 5 min.* *After 10 min.* *After 30 min.* *Never*	Hardware versions 1 – 3 only: Select optimum value for how long the backlight is dimmed before it is switched off
Standby	*After 1 min.* *After 2 min.* *After 5 min.* *After 10 min.* *After 30 min.* *Never*	Select optimum value for 'on' period before the instrument is set automatically to standby
Ext. Power	*Charge battery only* *Switch on and charge*	Hardware version 4 only: The *Ext. Power* setting determines whether the analyzer automatically switches on and charges when applied to external power or the analyzer just charges the battery. Hardware versions 1 – 3: This functionality is determined by a small, manual switch at the back of the analyzer. Remove the internal battery pack to access the switch

Note: If the instrument is externally powered, then the settings will be ignored.

D.3 Regional Settings

Table D.3 *Regional settings parameters*

Parameter	Values	Comment
Decimal Point	. ,	Select your preferred decimal point
Date Separator	- / .	Select your preferred date separator
Date Format	*yyyy-MM-dd HH:mm:ss* *dd-MM-yyyy HH:mm:ss* *MM-dd-yyyy HH:mm:ss* *yy-MM-dd hh:mm:ss XX* *dd-MM-yy hh:mm:ss XX* *MM-dd-yy hh:mm:ss XX*	Select your preferred date format: HH = 24 hour, hh = 12 hour, XX = AM or PM
Time Zone	*GMT-12* *GMT* *GMT+13*	Select the time zone of your region
Language	*English*, ...	A number of different languages are available for your 2250 Light. Hardware versions 1 – 3: Select your preferred language – if it is not on the list, then it might be available for installation using BZ-5503 Hardware version 4: All languages are installed
Keyboard	*United Kingdom*, ...	33 different keyboards. Select your preferred keyboard
Wind Speed Unit	*SI or US/UK*	Select *SI* for m/s or *US/UK* for mph
Temperature Unit	*SI or US/UK*	Select *SI* for °C or *US/UK* for °F
Dimension Unit	*SI or US/UK*	Select *SI* for m or *US/UK* for ft

D.4 Storage Settings

Table D.4 *Storage settings parameters*

Parameter	Values	Comment
Auto-naming of Projects	*Yes* *No*	Select *Yes* for automatically naming projects from the project start date as Year, Month, Date in the format YYMMDD, (for example, 051112 as 2005, November 12th) or *No* for using the name defined in the *Project Name Prefix* parameter
Project Name Prefix	Text string	Prefix for automatically generated project name. Maximum 8 characters

D.5 Headphone Settings

Table D.5 *Headphone settings parameters*

Parameter	Values	Comment
Listen to Signal	*No* *Input X-weighted* *Input C-weighted* *Input Z-weighted*	You can listen to the input signal for monitoring purposes. Select one of the A-weighted, B-weighted, C-weighted or Z-weighted signals **Note 1:** The frequency weighting of the signal you listen to can be selected independently of the frequency weighting of the measurement and the signal used for sound recording **Note 2:** X = frequency weighting A or B. 'A' requires that the *Broadband (excl. Peak)* parameter is set to *AC or AZ*. 'B' requires that the *Broadband (excl. Peak)* parameter is set to *BC or BZ*

Table D.5 *(Cont.) Headphone settings parameters*

Parameter	Values	Comment
Automatic Gain Control	*On* *Off*	To ease identification of sound sources, the gain can be automatically adjusted to keep the average level within a 40 dB range. You will hear clearly the whole signal content, whether the level has been 20 dB or 140 dB Set *Automatic Gain Control* to *On* to convert the signal at the headphone output Set *Automatic Gain Control* to *Off* for listening to the signal with a fixed gain
Gain for Meas.Signal	*– 80.0 dB to 60.0 dB for Automatic Gain Control set to Off* *– 60.0 dB to 0.0 dB for Automatic Gain Control set to On*	Key in a gain value (0.1 dB resolution) for the measurement input signal. Use '@' to assign the new value for immediate response at the output – or use the up/down navigation keys to increment/decrement the value in steps of 1 dB **Note:** 0 dB means 1 V output for 1 V input (*Automatic Gain Control* set to *Off*)
Gain for Annotations	*–60.0 dB to 60.0 dB*	Key in a gain value (1.5 dB resolution) for the commentary annotations. Use '@' to assign the new value for immediate response at the output – or use the up/down navigation keys to increment/decrement the value in steps of 1.5 dB

Note: If you do not want to listen to the input signal, then set 'Listen to Signal' = *No*, to economise on power.

D.6 Printer Settings

Table D.6 *Printer settings parameters*

Parameter	Values	Comment
Printer Used	*None* *MPS* *PCL* *PCL Inkjet* *PCL Laser* *Seiko DPU*	Select *None* if you don't have a printer connected to 2250 Light Select *MPS* for a Mobile Pro Spectrum thermal printer from AM-TECH Select *PCL* for a printer accepting PCL printer language Select *PCL Inkjet* for an inkjet printer accepting PCL language Select *PCL Laser* for a laser printer accepting PCL language Select *Seiko DPU* for the DPU-S245 or DPU-S445 thermal printer model from Seiko Instruments. See Chapter 8 for more details
Top Margin	*0.0 to 20.0 cm*	Use *Top Margin* to position the print on the paper
Left Margin	*0.0 to 20.0 cm*	Use *Left Margin* to position the print on the paper
Width	*1.0 to 15.0 cm*	Use *Width* to set the size of the print
Height	*1.4 to 20.0 cm*	Use *Height* to set the size of the print

D.7 Modem/DynDNS Settings

Table D.7 *Modem/DynDNS settings parameters*

Parameter	Values	Comment
Modem	*Disabled* *GPRS/EDGE/HSPA Dialup*	Set to *Disabled* if you do not have a modem connected; if you have connected a modem, but only want to use the SMS facility of the modem; or, when you physically connect or disconnect the modem. Set to *GPRS*/EDGE/HSPA *Dialup* if you have a *GPRS*/EDGE/HSPA modem connected and you want the analyzer to be connected to the Internet. See Chapter 7 and Chapter 8 for more details
Dialup Networking		
APN	<string of characters>	Access Point Name is an identifier required by the Network Operator. Examples are ‘internet’, ‘public’ and ‘www.vodaphone.de’. Please consult your network operator
User Name	<string of characters>	Set User Name as required by your network operator. Typically this can be left empty
Password	<string of characters>	Set Password as required by your network operator. Typically this can be left empty
Domain	<string of characters>	Set Domain as required by your network operator. Typically this can be left empty
DynDNS		
Active	*No* *Yes*	Set to *Yes* to make the update of IP-address at DynDNS.com active. Set to *No* if you don't use this service.
Hostname	<string of characters>	Set the Hostname defined in your account at DynDNS.com
User Name	<string of characters>	Set the User Name for your account at DynDNS.com.
Password	<string of characters>	Set the Password for your account at DynDNS.com. The password will be displayed until you press Enter, then it will be replaced by ‘***’

D.8 Network Settings

Table D.8 *Network settings parameters*

Parameter	Values	Comment
Location	Up to 20 characters	Use *Location* to specify a text identifying the analyzer or location of the analyzer. The Location will be displayed on the PC together with the serial number of the analyzer when browsing for analyzers in BZ-5503, and when connected using the on-line display
Network Connection	*None* *CF Socket* *LAN Socket*	Set to *None* if no Ethernet CF Card is present in CF Socket Set to *CF* Socket if Ethernet CF Card is present in CF Socket (hardware versions 1 – 3 only) Set to LAN Socket if you want to use the built-in LAN Socket on hardware version 4
Set IP Address	*Automatically* *Manually*	Set to Automatically to obtain an IP address from a DHCP server - if no server available, then a Link-local address will be set Set to *Manually* to set the *IP address*, *Subnet Mask*, *Default Gateway*, *Preferred DNS* and *Alternate DNS* manually
IP Address	xxx.xxx.xxx.xxx	The IP address of the instrument Selectable if Set IP Address = Manually
Subnet Mask	xxx.xxx.xxx.xxx	The Subnet Mask combined with the IP address identifies the network segment the analyzer is on Selectable if Set IP Address = Manually
Default Gateway	xxx.xxx.xxx.xxx	Address to a gateway for routing to another network Selectable if Set IP Address = Manually
Preferred DNS	xxx.xxx.xxx.xxx	The IP address of the primary DNS server
Alternate DNS	xxx.xxx.xxx.xxx	The IP address of the secondary DNS server

Table D.8 *(Cont.) Network settings parameters*

Parameter	Values	Comment
Name	Up to 32 characters	Name (SSID) of network you want to connect to. Update the name either by entering a name directly, or by tapping on the Available Networks and selecting a name from the list
Security	*Open* *Shared* *WPA PSK* *WPA2 PSK*	Select security as required by the network Open and Shared are for WEP (Wired Equivalent Privacy) Infrastructure mode WPA PSK is for WPA (Wi-Fi Protected Access) with Pre-shared Key (also called Personal mode) WPA2 PSK – WPA2 is an enhanced version of WPA
Encryption	*None* *WEP Enabled* *AES Enabled* *TKIP Enabled*	Select Encryption as required by the network None is for Open security WEP Enabled is for Open and Shared security. AES and TKIP Enabled are for WPA PSK and WPA2 PSK
Encryption Key	Up to 32 characters	Insert the encryption key required by the network. The key will be displayed until you press *Enter*, then it will be replaced by '***'

D.9 Notification Settings

Table D.9 *Notification settings parameters*

Parameter	Values	Comment
Notification	*Disabled,* *E-mail,* *SMS*	Set to *Disabled* to disable notifications. Set to *E-mail* to send notifications as email when an alarm occurs. Set to *SMS* to send notifications as SMS when an alarm occurs. See section 8.4 for the list of alarm types
Daily Status	*Enable* *Disable*	Set to *Enable* to send a notification once per day
Send at	*00:00:00 to 23:59:59*	Determines the time of day to send the daily status notification
Alarm Settings		
Internal Battery	*High,* *Low,* *Critical*	A notification is sent, if internal battery enters the set state
Disk Space	*0% to 100%*	A notification is sent, if free disk space drops to or below this setting
Email		
To	<string of characters>	The email address of the recipient of the email. Example: recipient@gmail.com **Note:** To find the @ symbol, click <Ctl+⇧>.
SMTP	<string of characters>	Name of SMTP (Simple Mail Transfer Protocol) Server.* Examples: gmail: smtp.gmail.com hotmail: smtp.live.com
SMTP Port	*0 to 65535*	Port used by SMTP Server.* Typically this is 25, but for Gmail and Hotmail it is 587
SSL/TLS	*No,* *Yes*	Secure Socket Layer/Transport Layer Security. Set to *Yes* if required by email provider*, otherwise *No*. SSL/TLS is required by Gmail/Google Mail and Microsoft® Hotmail®

Table D.9 *(Cont.) Notification settings parameters*

Parameter	Values	Comment
Account	<string of characters>	The account is typically the email address of the email used for sending the email.* Examples: myaddress@gmail.com myaddress@hotmail.com
User Name	<string of characters>	The User Name is typically the email address of the email used for sending the email.* Examples: myaddress@gmail.com myaddress@hotmail.com If the email account is part of a domain, then it might be necessary to specify the domain as part of the user name Example: Domain\UserName
Password	<string of characters>	Insert the password required for the account.* The password will be displayed until you press <Enter>, then it will be replaced by '***'
SMS		
Active	*No,* *Yes*	Set to *Yes* to activate the first phone number, otherwise set to *No*
Name	<string of characters>	Name identifying first phone number
Phone Number	Number	The number of the first SMS recipient
Active	*No,* *Yes*	Set to *Yes* to activate the second phone number, otherwise set to *No*
Name	<string of characters>	Name identifying second phone number
Phone Number	Number	The number of the second SMS recipient

* Please consult your email provider

D.10 Remote Access Settings

Table D.10 *Remote access settings parameters*

Parameter	Values	Comment
Web Server	*Disabled* *Enabled*	Set Web Server to *Enabled* to enable display and control of the analyzer on a web page - see section 7.4. Set to *Disabled* to disable the web server functionality
BZ-5503 Login Required	*Yes* *No*	Set to *Yes* to require user name and password for access to the instrument from BZ-5503 MPS or from the 2250/2270 SDK. Set to *No* for free access to the instrument. **Note:** If set to *Yes*, then you require BZ-5503 version 4.1 or higher to access the instrument
User Name	<string of characters>	Define the *User Name* required for full access to the web page, that is, view and control of the analyzer, and for access from BZ-5503 MPS and 2250/2270 SDK. Default: *admin*
Password	<string of characters>	Define the password required for full access to the web page, and for access from BZ-5503 MPS and 2250/2270 SDK. The password will be displayed until you press **Enter**, then it will be replaced by '***'. Default: *admin*
Guest Login Required	*Yes* *No*	Set to *Yes* to require user name and password for login to the guest web page. Set to *No* for free access to the guest web page.
Guest User Name	<string of characters>	Define the user name required for limited access to the web page, i.e. view of the instrument only Default: guest
Guest Password	<string of characters>	Define the password required for limited access to the web page. The password will be displayed until you press <Enter>, then it will be replaced by '***' Default: guest

D.11 NMT Server Settings (Hardware Version 4 only)

For set up of NMT Server communication used by Noise Monitoring Software BZ-7232, see User Manual for Noise Monitoring Terminal Types 3639-A, B and C, BE 1818.

Appendix E

Glossary

A-weighting Filter: Frequency weighting corresponding approximately to the 40 dB equal loudness curve, that is to say, the human ear's response at low to medium sound levels. It is by far the most commonly applied frequency weighting and is used for all levels of sound.

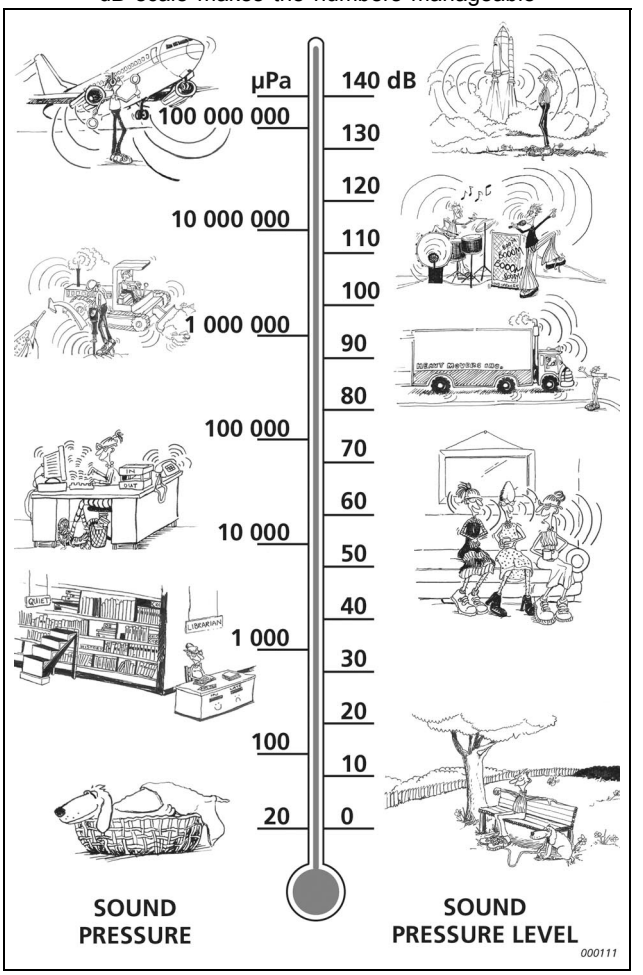
B-weighting Filter: Frequency weighting corresponding approximately to the 70 dB equal loudness curve, that is to say, the human ear's response at medium sound levels.

C-weighting Filter: Frequency weighting corresponding to the 100 dB equal loudness curve, that is to say, the human ear's response at fairly high sound levels. Mainly used when assessing peak values of high sound pressure levels.

Criterion Level: Criterion Level is the maximum averaged sound level allowed for an 8-hour period. Used for calculation of Dose, ProjDose, DoseUQ and ProjDoseUQ, where U = F or S and Q = 4, 5 or 6 dB.

Decibel (dB): The measurement unit for expressing the relative intensity of sound. A direct application of linear scales (in Pa) to the measurement of sound pressure leads to large and unwieldy numbers. As the ear responds logarithmically rather than linearly to stimuli, it is more practical to express acoustic parameters as a logarithmic ratio of the measured value to a reference value. This logarithmic ratio is called a decibel or dB. The advantage of using dB can be clearly seen in the below illustration. Here, the linear scale with its large numbers is converted into a manageable scale from 0 dB at the threshold of hearing (20 μPa) to 130 dB at the threshold of pain (~100 Pa).

Our hearing covers a surprisingly wide range of sound pressures – a ratio of over a million to one. The dB scale makes the numbers manageable



Dose, ProjDose:

The Noise Dose is the equivalent averaged A-weighted Noise Level (taking the Threshold Level into account) using Exchange Rate = 3 for an 8 hour period (reference duration) relative to the maximum allowed (the Criterion Level) – expressed in percentage.

Example: If the Criterion Level is 85 dB and a person is exposed to a constant sound pressure level of 85 dB for 8 hours, then the Dose is 100%. A constant level 88 dB results in a Dose of 200% and a constant level of 82 dB results in a dose of 50%.

The Projected Dose is the Noise Dose based on measurement duration less than 8 hours, assuming the sound level for the remaining time stays the same.

DoseUQ, ProjDoseUQ: The Noise Dose is the averaged A-weighted Noise Level (taking the Threshold Level into account) with Time Weighting U = F or S and Exchange Rate Q = 4, 5 or 6 for an 8 hour period (reference duration) relative to the maximum allowed (the Criterion Level) – expressed in percentage.
Example: If the Criterion Level is 90 dB and a person is exposed to a constant average sound level of 90 dB for 8 hours with Time Weighting S and Exchange Rate 5, then the DoseS5 is 100%. A constant level 95 dB results in a DoseS5 of 200% and a constant level of 85 dB results in a doseS5 of 50%.
The Projected DoseS5 is the Noise DoseS5 based on measurement duration less than 8 hours, assuming the sound level for the remaining time stays the same.

E: Sound Exposure is the energy of the A-weighted sound calculated over the measurement time. The unit is Pa^2h.

Exchange Rate: Exchange Rate is the increase in noise level that corresponds to a doubling of the noise level. The Exchange Rate is used for calculation of L_{avUQ}, TWA, TWA_v, DoseUQ and ProjDoseUQ, where U = F or S and Q = Exchange Rate: 4, 5 or 6 dB.
Note: L_{Aeq} is always based on an Exchange Rate = 3.

Exposure Time: Exposure Time is the actual time that a person is exposed to noise during a workday. Used for calculation of $L_{ep,d}$ and $L_{ep,d,v}$.

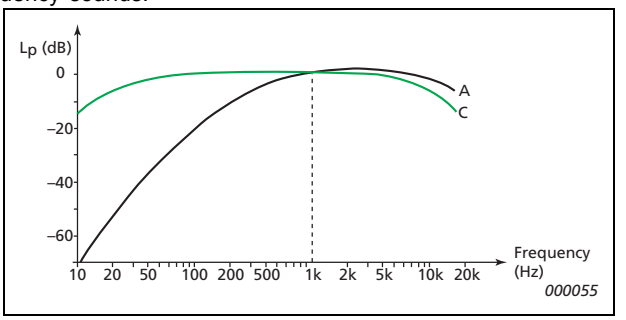
'F', 'S' or 'I' Time Weighting: A time weighting (sometimes called a 'time constant') defines how the exponential averaging in root-mean-square (RMS) measurement is done. It defines how the heavily fluctuating sound pressure variations are smoothed or averaged to allow useful readings. The standards define three time weightings: F (Fast), S (Slow) and I (Impulse). Most measurements are carried out using the 'F' time weighting, which uses a 125 ms time constant.

Frequency: The number of pressure variations per second. Frequency is measured in hertz (Hz). The normal hearing for a healthy young person ranges from approximately 20 Hz to 20000 Hz (20 kHz).

Frequency Weighting: Our hearing is less sensitive at very low and very high frequencies. In order to account for this, weighting filters can be applied when measuring sound. The most commonly used weighting is the 'A-weighting', which approximates the human ear's response to low – medium noise levels.

Frequency Weighting (contd.):

A 'C-weighting' curve is also used, particularly when evaluating very loud or low-frequency sounds.



L_{AE}:

Sound Exposure Level – sometimes abbreviated SEL and sometimes called Single Event Level, is the Sound Exposure expressed as a level. The letter 'A' denotes that the A-weighting has been included.

L_{Aeq}:

A widely used noise parameter that calculates a constant level of noise with the same energy content as the varying acoustic noise signal being measured. The letter 'A' denotes that the A-weighting has been included and 'eq' indicates that an equivalent level has been calculated. Hence, L_{Aeq} is the A-weighted equivalent continuous noise level.

$L_{Xeq,T,mov}$ and $\Delta L_{eq,T,mov}$:

Moving (or sliding) X-weighted average (equivalent continuous noise level) for the latest T minutes. Updated every second during measurement. The parameter can be used to monitor the average noise level within T minutes, for example, to monitor that the noise level during a music event doesn't exceed a certain limit at any 15 minutes of observation time during the event. The value is equal to L_{Xeq} at the start of the measurement as long as the elapsed time less than or equal to T. Two values with frequency weighting X = A and C are measured simultaneously. $\Delta L_{eq,T,mov}$ is calculated as the difference between $L_{Ceq,T,mov}$ and $L_{Aeq,T,mov}$

$L_{Xeq,T,mov,max}$ and $\Delta L_{eq,T,mov,max}$:

The maximum of the $L_{xeq,T,mov}$ values during the measurement, only taking values into account where elapsed time is greater than or equal to T. Two values with frequency weighting X = A and C are measured simultaneously. $\Delta L_{eq,T,mov,max}$ is calculated as the difference between $L_{Ceq,T,mov,max}$ and $L_{Aeq,T,mov,max}$

L_{AF}:

The instantaneous time-weighted sound level, Lp, is available at any time. 'A' denotes that the A-frequency weighting is used. 'F' denotes that the Fast time-weighting is used.

L_{AFmax}:

Maximum time-weighted sound level measured with A-frequency weighting and Fast time weighting. It is the highest level of environmental noise occurring during the measurement time. It is often used in conjunction with another noise parameter (for example L_{Aeq}) to ensure a single noise event does not exceed a limit.

L_{AFmin}: Minimum time-weighted sound level measured with A-frequency weighting and Fast time weighting. It is the lowest level of environmental noise occurring during the measurement time (time resolution is 1 s).

$L_{AF90.0}$: The noise level exceeded for 90% of the measurement period with A-frequency weighting and Fast time weighting. The level is based on statistical analysis of a parameter (LAF or LAS) sampled at 10 ms intervals into 0.2 dB wide classes. The percentage is user-definable.
An analysis of the statistical distributions of sound levels is a useful tool when assessing noise. The analysis not only provides useful information about the variability of noise levels, but is also prominent in many standards as the basis for assessing background noise. For example, L_{AF90} is used as an indicator of background noise levels while L_{AF10} or L_{AF5} are sometimes used to indicate the level of noise events.

$L_{A90.0}$: The noise level exceeded for 90% of the measurement period with A-frequency weighting. The level is based on statistical analysis of L_{Aeq} sampled at 1 s intervals into 0.2 dB wide classes. The percentage is user-definable.

$L_{AF(SPL)}$: The Sound Pressure Level (maximum time-weighted sound level during the latest second) is available at any time. 'A' denotes that the A frequency weighting is used. 'F' denotes that the Fast time-weighting is used.

L_{AFTeq}: Taktmaximal Mittelungspegel as defined by DIN 45641. L_{AFTeq} has also been called L_{AFTm5} or L_{ATm5F}.

L_{avUQ}: Average Sound Level with Time Weighting U = F or S and Exchange Rate Q = 4, 5 or 6. This is a widely used occupational health noise parameter in the USA, corresponding to the L_{Aeq} used otherwise.

L_{Cpeak}: Maximum peak sound level during a measurement. ‘C’ denotes that the C frequency weighting is used. Used for assessing possible damages to human hearing caused by very high short-duration noise levels.

$L_{Cpeak,1s}$: Maximum peak sound level during the latest second – is available at any time. 'C' denotes that the C frequency weighting is used. Used for monitoring the peak levels.

$L_{ep,d}$: The Daily Noise Exposure Level is the average A-weighted noise exposure level for a nominal 8-hour working day. $L_{ep,d}$ is also known as $L_{EX,8h}$. $L_{ep,d}$ is calculated from the measured L_{AE}, the setting of Exposure Time and a Reference time of 8 h. Used for assessing the noise exposed to a worker during a working day – in accordance with ISO standards.
The European Noise at Work Directive 2003/10/EC defines the following limit and action values:
Exposure Limit Value: 87 dB
Upper Exposure Action Value: 85 dB
Lower Exposure Action Value: 80 dB

$L_{ep,d,v}$: The Daily Noise Exposure Level for a user-defined reference period. $L_{ep,d,v}$ is calculated from the measured L_{AE} and the settings of Exposure Time and Reference Time. Used, for example, for calculating a Weekly Noise Exposure Level, by setting the Reference Time to 40 h.

Loudness, Loudness Level: Loudness is the subjective judgement of intensity of a sound by humans. Loudness depends upon the sound pressure and frequency of the stimulus and whether the sound field is diffuse- or free-field. The unit is the Sone. Loudness Level = 10*log2(Loudness) + 40. The unit is the Phone. The Zwicker method of calculation of stationary loudness based on 1/3-octave measurements is described in ISO 532 – 1975, Method B.

#CPeaks(>140dB): The number of 1 s peak sound levels over 140 dB. 'C' denotes that the C-frequency weighting is used.
Three peak counters are available – one with a user-definable value (set to 140 dB by default), one with 137 dB and one with 135 dB value. Used for assessing possible damage to human hearing caused by very high, short-duration, noise levels.
The European Noise at Work Directive 2003/10/EC defines the following limit and action values:
Limit Value: 140 dB corresponding to 200 Pa
Upper Action Value: 137 dB corresponding to 140 Pa
Lower Action Value: 135 dB corresponding to 112 Pa

NC, NC Decisive Band: Noise Criteria is used to rate steady-state continuous noise in a room from all types of equipment, including fans, mixing boxes, diffusers, etc.
The rating is determined from 1/1-octave L_{Zeq} spectra compared with NC curves (based on equal loudness curves). The NC rating is the value of the rating curve that falls entirely above the measured data. The Decisive Band is the frequency band 'touching' the NC curve.
Defined in ANSI 12.2–2008

NCB, NCB Classification, Rumble, Hiss, RV: Balanced Noise Criteria is a refinement of NC.
The rating is determined by the SIL value and gets the Classification (R) for Rumble, if the spectrum is rich in low frequency sound (16 Hz to 500 Hz), the Classification (H) for Hiss, if the spectrum is rich in high frequency sound (1 kHz to 8 kHz), or the Classification (RV) for Vibration and Rattle if the spectrum at low frequencies (16 Hz to 63 Hz) is likely to produce audible rattling in lightweight building elements.
The details of the NCB rating are defined in ANSI S12.2-1995

NR, NR Decisive Band: Noise Rating rates noise levels at public or private indoor areas.
The rating is determined from 1/1-octave L_{Zeq} spectra compared with NR curves (based on equal loudness curves). The NR rating is the value of the highest NR curve 'touched' by the measured spectrum. The Decisive Band is the frequency band 'touching' the NR curve.
Defined in ISO R1996(1971)

Occupational Health Standards:

Typical Setup Parameter settings for Occupational Health measurements in accordance with various standards:

- OSHA (Occupational Safety and Health Administration) – 29 CFR 1910.95
- MSHA (Mine Safety and Health Administration) – 30 CFR 62.0 UMHRPEL
- DOD (Department of Defence) – DoD Instruction 6055.12
- ACGIH (American Conference of Government Industrial Hygienists) – DHHS Pub 98-126
- ISO – UK Noise at Work Regulations SI 1989/1790 amended by SI 1992/2966 and SI 1996/341

See the table below, but please also check your local legislation.

Table E.1 *Occupational Health Setup Parameters and Associated Standards*

Setup Parameters	OSHA	MSHA	DOD	ACGIH	ISO
Broadband (excl. Peak)	A	A	A	A	A
Broadband Peak	Z	Z	Z	Z	C
Exposure Time	N/A	N/A	N/A	8:00:00	8:00:00
Reference Time (Preset)	8:00:00	8:00:00	8:00:00	8:00:00	8:00:00
Reference Time (user-definable)	40:00:00	40:00:00	40:00:00	40:00:00	40:00:00
Threshold Level	80	80	80	80	70
Criterion Level	90	90	85	85	85, 90
PeaksOver Level[*]	140	140	140	140	140
Exchange Rate for Lav	5	5	4	N/A	N/A
Weighting for Lav	S	S	S	N/A	N/A

*. This is user-definable – the two other 'PeaksOver Level' parameters are preset to 137 and 135 dB resp.

Reference Time:

Reference Time is used for calculation of Sound Exposure Level $L_{ep,d,v}$ or Time Weighed Average TWA_v with a reference time other than 8 hours.

RC, RC Classification: The Room Criterion Mark II is primarily a diagnostic tool for HVAC noise in spaces.
The RC curve is chosen as the value of the PSIL, rounded to the nearest integer, in the range $25 \leq RC \leq 50$.
The RC classification is the combination of the Sound Quality Descriptor and the Probable Occupant Evaluation.
The sound quality descriptor can display the values (N) for neutral, where no frequency range is dominant; (LF) for rumble, where the low-frequency range (16 – 63 Hz) is dominant; (MF) for roar, where the mid-frequency range (125 – 500 Hz) is dominant; and (HF) for hiss, where the high-frequency range (1000 – 4000 Hz) is dominant. Furthermore, there are two variations of (LF) if the spectrum in the low-frequency range is likely to introduce vibrations: (LFVA), where there are clearly perceptible vibrations and (LFVB), where there are moderately perceptible vibrations.
The probable occupant evaluation describes how an occupant responds to a spectrum and can have the values *Acceptable*, *Marginal* or *Objectionable*.
Described in the ASHRAE Handbook – HVAC 2011 and ANSI 12.2–2008.
Room Criteria is for rating room noise

SIL, PSIL, SIL3: SIL (Speech Interference Level) is the arithmetic average of the 500 Hz, 1 kHz, 2 kHz and 4 kHz octave band levels.
PSIL (Preferred Speech Interference Level) is the arithmetic average of the 500 Hz, 1 kHz and 2 kHz octave band levels.
Used for evaluating the interference of noise upon speech communication.
SIL3 (Speech Interference Level based on highest 3 octaves) is the arithmetic average of the 1 kHz, 2 kHz and 4 kHz octave band levels.
Note: Though SIL, PSIL and SIL3 are defined for octave band levels they are also calculated for 1/3-octave band levels by summing the power values in the three bands within each octave before doing the averaging.

Sound: Any pressure variation that the human ear can detect. Just like dominoes, a wave motion is set off when an element sets the nearest particle of air into motion. This motion gradually spreads to adjacent air particles further away from the source. Depending on the medium, sound extends and affects a greater area (propagates) at different speeds. In air, sound propagates at a speed of approximately 340 m/s. In liquids and solids, the propagation velocity is greater – 1500 m/s in water and 5000 m/s in steel.

Sound level or sound pressure level: The level in decibels of the pressure variation of a sound. See also **decibel**.

Std.Dev. The Std.Dev. is calculated as the Standard Deviation of the noise samples used for statistics. This is either L_{AF} or L_{AS} sampled every 10 ms or L_{Aeq} sampled every second.

T_{Cpeak}: The time when the peak sound level occurred. 'C' denotes that the C-frequency weighting is used.

Threshold Level: Any sound levels below the threshold level do not contribute to the Dose measurement data. For example, if you set the threshold level to 80, any sound levels below 80 dB are not taking into consideration by the instrument, when it calculates doses and time weighted averages.
Used for calculation of Dose, ProjDose, TWA, TWA_V DoseSQ, ProjDoseSQ.

TWA: The Time Weighted Average is the average A-weighted sound level for a nominal 8-hour working day with Time Weighting S and Exchange Rate 5. TWA is calculated from the measured LavS5 (taking Threshold Level into account) and a Reference time of 8 h. Mainly used in the USA for assessing the noise exposure for a worker during a working day.

TWA_V: The Time Weighted Average for a user-defined reference period. TWA_V is calculated from the measured LavS5 (taking Threshold Level into account) and the Reference Time. Used, for example, for calculating a Weekly Time Averaged Level by setting the Reference Time to 40 h.

Underrange Immediate underrange indicates that the broadband sound level is below the lower limit of the Linear Operating Range and is indicated separately for the two selectable frequency weightings.
Immediate underrange is only indicated on the screen. No underrange information is saved with the final result of the measurement.
The underrange indication is implemented as required by ISO 61672–1:2013 and does not account for the influence of self-generated noise from the microphone because the specifications for the lower limit of the Linear Operating Range apply for measurements of electrical signal inserted into the preamplifier through the applicable input device. This makes the underrange indication a dubious indicator of the quality of the measurement.
Example: *Und. A* – Immediate underrange for the A-weighted levels

Z-weighting: 'Zero'- frequency weighting is without any frequency weighting, that is, equivalent to Linear, LIN or FLAT.

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